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THE METAL INDUSTRY

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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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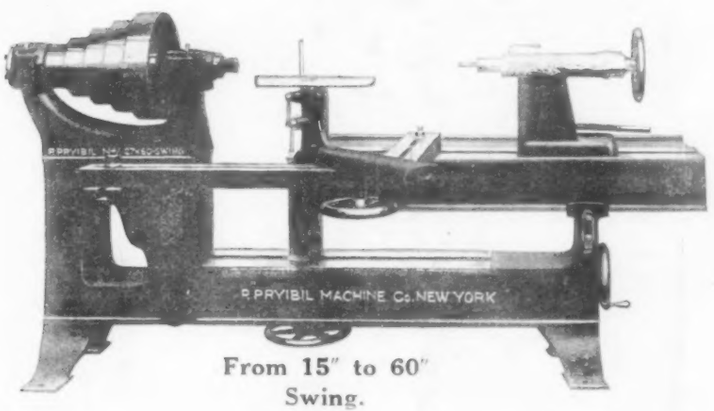

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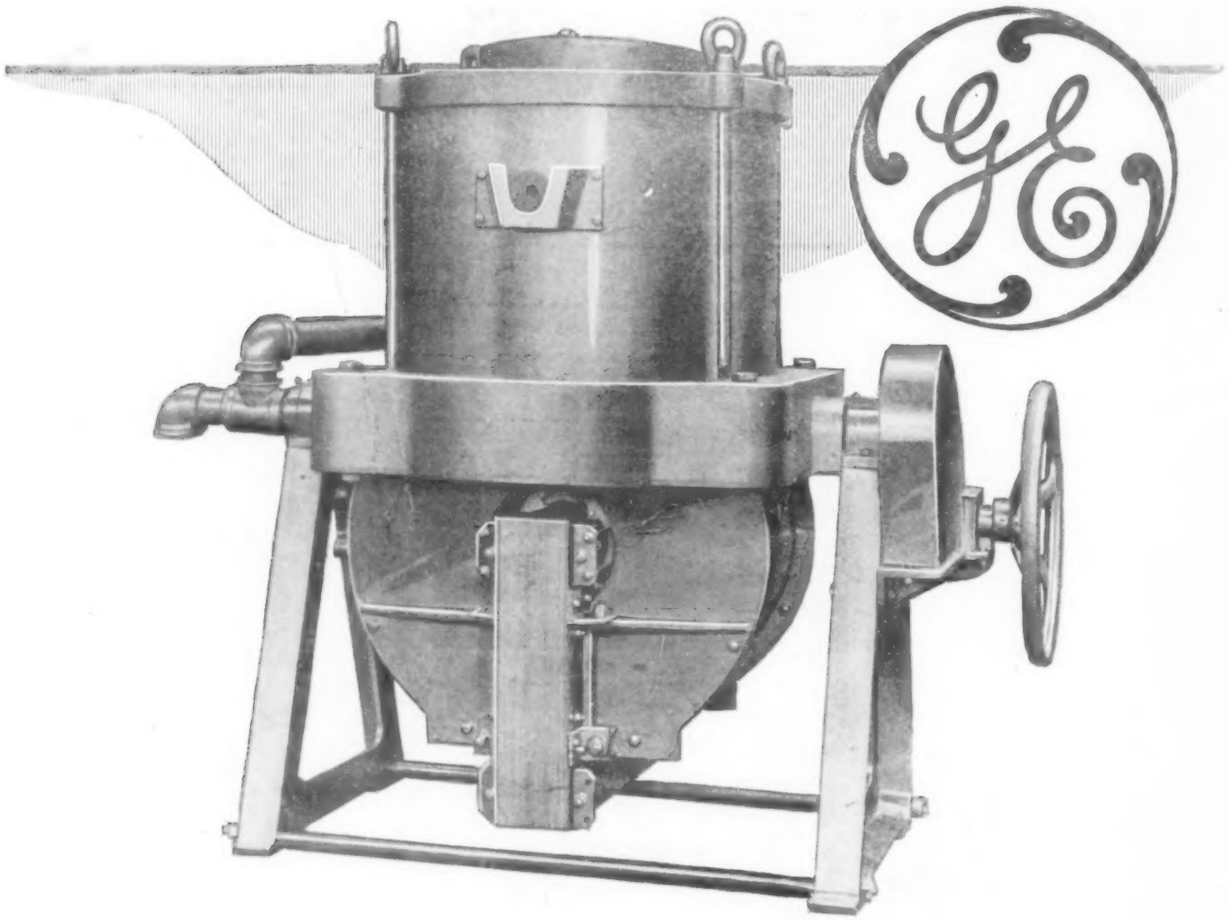

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Vol. 20 NEW YORK, DECEMBER, 1922 No. 12

Centrifugal Casting

An Abstract of a Paper Describing the History, Field of Application, Mechanics and Thermal Conditions*

By LEON CAMMEN

Centrifugal casting of metals is an old art, but it did not assume commercial importance until the last decade. Since then, however, while it has not attracted much public notice, its progress has been very rapid. It has already become an important factor in such industries as the manufacture of paper-mill rolls and railroad car wheels.

The Sandusky Foundry and Machine Company, Sandusky, Ohio, employs centrifugal casting to produce bronze paper-mill rolls and propeller sleeves, which would be much more expensive and probably less satisfactory if cast in a stationary mold.

Of late, centrifugal casting has acquired a further importance in the development of a method by which tubes and hollow billets can be successfully cast of such metals as monel metal and alloy steels, which can neither be cast into thin-walled tubes nor pierced by the ordinary methods.

A survey of the literature and of the numerous patents issued on centrifugal casting in the United States and in Europe would indicate that practically all the essential features were covered by patents issued prior to the beginning of the twentieth century, with the exception, however, of those dealing with the temperature control of the metal, which is a new feature. It would appear, therefore, that with the exception of minor details and one or two features in special casting processes there is no reason why any good engineer could not design and operate a successful casting machine with a non-heated or non-cooled mold without running into legal complications.

MECHANICS OF CENTRIFUGAL CASTING

The usual way of casting is by introducing molten metal into the spinning mold. In centrifugal casting the distinction should be clearly made between jobbing work and mass production. For the former, clay molds in iron cases have been used practically exclusively, as it would not pay to make a permanent mold for only a few castings. When it comes, however, to production on a tonnage basis, such as tubing or pipe, a permanent mold is practically the only feasible way of doing it. Crucible graphite or zirconium tubes have been successfully used for castings not in excess of 3 ft. in length, but for longer ones, metal molds are to be preferred. Fairly successful results have been obtained with chrome-nickel alloys, though it is not expected that this will be the material finally adopted, as enough work has been done already on the production of cast tungsten to make it certain that a mold of this still rather mysterious material will be available within a comparatively short time.

Up to about two years ago very little work, as far as the writer knows, had been done successfully on the problem of casting, centrifugally, comparatively thin sections, say, under ⅜ in., in such metals as steels or monel and in lengths beyond 3 ft. On the other hand, large castings in brass, bronze, cast iron and even steel have been made with considerable success. The reason for this lies in the failure to understand the thermal conditions in the mold and the process underlying the freezing of the metal.

There is a basic difference between casting in a stationary mold and in a spinning mold. In making castings in the former, whether it be a simple ingot or a complicated casting from a pattern, the foundryman has means to provide for the escape of gas from the metal and for taking care of the cavities produced by contraction in cooling. In a casting from a pattern, sink heads are provided, while in an ingot casting the top of the ingot acts as a sink head, in addition to which special methods such as "dozzling" may be used to keep the top of the ingot hot as long as possible, and increase the efficiency of the ingot top in performing the functions of the sink head in molds. In both cases the foundryman is prepared to discard as defective a certain part of the casting (the ingot head, risers, sink heads), and his skill lies partly in reducing the quantity of discard as far as possible, and especially in directing the process so as to restrict the presence of defective metal to the parts which he is prepared to discard.

In centrifugal casting, however, there is no riser or anything corresponding to the ingot top, and the cooling proceeds essentially at a uniform rate all along the length of the tubular shape. It is obvious, especially in tubes of small diameter and considerable length, such as 6 in. outside diameter and 16 ft. long, that the loss of heat inward must be extremely small, because the entire inner air cylinder is surrounded by metal at approximately the same temperature. Heat is therefore lost mainly out-

* This paper was presented before the American Society of Mechanical Engineers, at the Atlanta, Ga. meeting, May 8-11, 1922. The author is Associate Editor of Mechanical Engineering. It has not been published elsewhere.

ward to the mold and through it to the air. As a result of this, the part of the casting in immediate contact with the mold chills first. The problems with which the "centrifugal" foundryman as to deal are essentially the same as those which confront the man pouring into stationary molds, and these are, first, to get rid of the occluded gases, and second, to take care of contraction cavities As regards occluded gases and slags, it would appear at first sight, especially to those familiar with such centrifugal processes as cream separation, that they would be eliminated automatically; pure metal, being heavier than either slag or metal containing gases, should be thrown to the outside, against the wall of the mold, while all impurities should go to the inner wall. This does actually happen, provided one condition is satisfied, **and that is that sufficient time is available.**

The second problem is that of cavities formed in the casting as a result of contraction in cooling. As stated above, the part of the casting in immediate contact with the mold chills first. In doing so, it contracts, and if left to itself, might easily form contraction cavities and thin spots. If, however, the rest of the metal is still in a liquid state, it is projected, with a pressure at the rate of, say, 100 pounds per pound of metal, against the chilled layer, and fills all possible cavities with an efficiency many times greater than can be obtained with sink heads in stationary casting. (To obtain the same results in a stationary mold, it would have been necessary to put into the sink head 99 pounds of metal for every pound of metal in the actual casting, a proposition that is not likely to appeal to a sane foundryman. This again presupposes, however, that the cooling proceeds at a fairly slow rate, and enough time is available for each succeeding layer to take care of chill conditions in the preceding layer. In cold-mold centrifugal casting, which means with a mold warmed only enough to take off the chill, say 300 to 400 deg. Fahr., temperature conditions do not favor slow cooling. This is one of the reasons of the many past failures to produce thin-walled steel tubing by centrifugal casting. On the other hand, very excellent steel tubes (both plain carbon and nickel alloy) have been produced with diameters ranging from 10 in. up and wall thicknesses up to 3½ inches. In the latter case there is so much metal in comparison with the area in contact with the mold that enough time is available to produce a good segregation of impurities inward before the inner wall freezes.

It would appear, therefore, that the secret of producing centrifugally, thin metal castings (under ½ in.) lies in establishing conditions under which the cooling of the molten metal will proceed at a fairly slow rate. This applies, of course, only to such metals as steel and monel, but not to bronze, which is governed by different conditions. In the Cammen process this has been accomplished by pre-heating the mold to a temperature close to the melting point of the metal itself, which may vary from, say, 1,600 to 2,000 deg. Fahr, for steel and monel-metal castings. Under these conditions a 3/16-in. wall takes about 45 to 60 sec. to harden entirely, whihc is sufficient to produce clean metal. Casting in such extremely hot molds is a rather novel procedure and at first one might anticipate trouble due to oxidation and warping of the molds, and the diffculty of handling big molds conveniently. As a matter of fact, however, with proper equipment it offers comparatively few difficulties. The question of oxidation of molds is taken care of by using proper alloys, such as alloys of a nickel-chrome base or cast tungsten (the latter is not yet being done on a commercial scale). The question of warping is partly taken care of by the same use of proper alloys, but mainly by the use of extremely substantial molds and proper facilities for handling them between the casting machine, the transfer table and the furnace. In all this handling, the molds have to be properly supported throughout the entire length, either by carrying them on a very heavy "horn" extending from one end of the mold to the other, or in a cradle supporting the mold throughout its length.

FIELD APPLICATION OF HOT-MOLD CENTRIFUGAL CASTING

The particular feature that determines the field of application of hot-mold centrifugal casting is the ability to produce cast shapes of comparatively thin metal (down to ⅛ of an inch) in great length, with our present knowledge of the art, up to 20 ft. One of the first applications that comes to mind is in the production of seamless tubing.

Hitherto the principal tonnage of seamless tubing has been made by the Mannesmann piercing process and its variations. Essentially this process consists in imparting such a twisting motion to a billet as to break down its central fibers. This motion is set up by means of obliquely placed rolls or disks. There are several objections to this process. In the first place, while it does pierce high-grade mild steel or Muntz-metal billets, it stresses the central part of the billet far beyond its elastic limit. While apparently this does not affect very seriously the tensile strength of the finished product after it has been cold-drawn or hot-rolled, there is good reason to believe that it impairs the resistance of the metal to corrosion, the latter, as we know now, being particularly active in the case of metals stressed up to or beyond the elastic limit. Furthermore, the Mannesmann process is not at all applicable to metals which are either extremely tough or very brittle. Thus, all attempts to produce commercially by the Mannesmann process, hollow billets of either monel metal or Admiralty brass have so far failed. Not only that, but the Mannesmann process, by its very character, is limited to the production of comparatively small sizes, not in excess of 6 in. in diameter; while experimentally larger sizes have been made, the 6-in. limit has been pretty well established for standard commercial grades. It is obvious that as we go up in sizes, the piercing mills used in this process increase in cost with great rapidity, and as the cost of even a small Mannesmann mill easily runs into six figures, the cost of the big ones becomes prohibitive after passing a certain limit, which is around 6 in.

At the same time there is a demand for larger sizes of tubing of greater strength than a single-welded joint can give, and this is where the most obvious field of hot-mold centrifugal casting appears. With this process, tubing in extra heavy and double extra heavy thicknesses can be easily produced in sizes up to 24 in. in diameter at a cost per ton that can compete with plain welded tubing and it is considerably lower than that of double-welded tubing such as is used for hydro-electric installations.

The casting of gears by centrifugal methods, in particular worm and herringbone gears, has been achieved with great success both in England and in America, especially in this country. As far as the writer is aware, however, all such gears have been cast in non-ferrous metals and not in steel.

There is an old saying current among molders to the effect that a lie in sand will be shown up in the metal. The same applies with still greater force to centrifugal casting. The slightest mistake in the layout of the machinery or use of poor materials in the machine, its bearings and foundations, will produce an uneven casting, result in excessively rapid wear in the molds, and at times may even cause disastrous accidents with danger to life. At the same time, with good engineering and the use of first-class materials, centrifugal casting may be carried on entirely by semi-skilled labor and still give products of unsurpassed excellence.

Standard Foundry Costs

A Review of the Criticism of W. L. Churchill, Industrial Engineer*

By THOMAS HARPER, Brass Foundryman

The opening paragraph of Mr. Churchill's criticism states that my address on "Standard Foundry Costs" contains so many "faulty assumptions and such dangerous principles that I (Mr. Churchill) feel attention should be called to them before they effect serious harm." I wish to state before I go any further that I consider the title of Mr. Churchill's article unwarranted. My business career of over thirty years of honest and successful operation has proved that I must have more than "a little knowledge."

I do not agree with Mr. Churchill in his use of a steamboat engineer as an illustration. He shows a very little knowledge of marine affairs. The captain, especially if he is the owner, is the man who is responsible for the whole enterprise and conducting the operations at a profit through knowing his costs. He is the CHIEF EXECUTIVE. The ENGINEER occupies the same position as FOUNDRY FOREMAN. Their province is to produce power in the one case and castings in the other. Each in their department is needed to conserve equipment, materials, and supplies and to handle the productive labor efficiently.

The great trouble in all lines of business, foundries included, is that there are so many **engineers** or **foremen** who think that all they need to make them CAPTAINS is CAPITAL. When they get that they start in business without understanding the rules or laws of navigation as applied to their business and they never seem to realize what they should know. When they start out they run amuck and do injury to everyone in the same line of business, and you cannot disrate them before they have smashed themselves into the Bankruptcy Court.

"Now to the specific faults of Mr. Harper's 'Cost Engine.' First let us take up the matter of melting costs. He has placed a melting cost of 8c. per pound against each size of product castings. The fallacy of this lies in the fact that melting costs do not parallel the weight of the completed castings but of the metal melted." **There is no fallacy in the Example of Pound Price List.** This price list was computed from the average molders' hour cost and we figured out the output from those hours for a given weight from the average molds made per hour. The price of 8c. per pound was the average price for melting all of the different alloys with the exception of aluminum, and the average of all the different weights of castings poured. To be specific this cost for melting is the average cost of melting 196,000 pounds of metal constituting the different alloys we make to produce 100,000 pounds of castings SOLD, billed and delivered. That price includes the labor, fuel, supplies, overheads, and burden charged to melting. This total is reduced to the average of 8c. per pound to be charged to castings SOLD (not just completed, as some might be left on our hands). The touchstone of all cost systems is the product sold.

In compiling this "Example of Pound Price List," why should I use other than an average melting cost? It parallels an average molding hour cost and an average number of molds made. Further, this disproves the insinuation you wish to make of an "agreement, direct or implied, among brass foundrymen in regard to prices." To do that it would be necessary to construct tables for each of the many different alloys that brass foundries make when called upon. Each of these alloys have losses in metal and costs of melting that are typical of the alloy, the melting equipment, and the castings to be made. All that is possible to show is an example of how to draw up a price list or chart to sell by. The brass foundryman has still got to use his brains in the use of his price list compiled from his OWN COSTS, as I reiterated all through my address.

Your criticism, Mr. Churchill, bobs around so much that it is very hard to get any continuity to it. But, in my opinion, what you are really trying to establish is the assertion contained in the following sentence: **"Profits should not be placed on the materials purchased but on the services rendered to customers."** Mr. Churchill seems to think that when he says anything that **makes it so** and when he offers to **bet, that proves it,** and when anyone differs with him, he makes faulty assumptions and states dangerous principles.

Profits should be placed on metal, labor, materials, and expenses of whatever nature that are incurred in rendering service to customers, and to give equal justice to all customers, they should be uniformly applied to all classifications of service that is rendered to customers. That appears to me to be the logical reason why it is necessary to **get costs**—that is to deal fairly by your customers and deal fairly by yourself.

Mr. Churchill says that metal dealers would gladly pay me a handsome pension for showing them how to sell any appreciable quantity of metal used in brass foundries at a 10% profit. The American Metal Market Report on the day this is written quotes dealer's buying prices:

Copper, light	9.75—10.50	add 10%	11.55
Copper, crucible	11.50—12.00	add 10%	13.20
Composition scrap	8.50— 9.25	add 10%	10.17
Brass, heavy	5.25— 6.75	add 10%	7.43

Metal dealers quote the same day for ton lots or more:

Copper	14.50
Composition	12.00
Heavy Brass	9.50

Not much chance for my pension is there? The metal dealers perform the same functions as the brass foundries but reversed. They buy in small quantities and sell by the ton. The brass foundries buy by the ton and sell by the pound. Both the metal dealers and the foundries have to carry a stock of the varied metals to meet the needs of their customers. That is merchandising. In addition the foundries fabricate or manufacture the metals into castings, thus performing two separate functions and are entitled to a profit on each.

Now to the high finance example of No. 1 and No. 2 foundries. For No. 1 foundry on an investment of $25,000 in equipment and employing 25 molders you figure out a yearly profit of $24,975. On the No. 2 foundry employing 25 molders and with an investment of $25,000 in equipment you figure out a yearly profit of $197,700. It is wonderful the possibilities of profiteering in my cost system combined with Mr. Churchill's investment amount of $25,000 in equipment to run a 25 molder foundry. It makes the usurious loan sharks and boot leggers look like two cents, and to do it in the brass foundry business too! I never thought it was in it! Why if I had brains, all I would have to do with the $24,975 is to add another $25 and start up another foundry. The next year I can start another two foundries. That would make four and the next year eight, and so on. It is tre-

* The article by W. L. Churchill was published in our issue of November, 1922.

mendous. But before others catch on to the idea, would you please tell me where to finance the business on a total investment of $25,000 in equipment for a 25 molder foundry. No. 1 Foundry—yearly profit, 10% = $24,975. Yearly business—$249,750.00. No. 2 Foundry—yearly profit, 10% = $197,700. Yearly business—$1,977,000.00. No. 1 Foundry with a yearly turnover of four times needs capital of $62,437.00. No. 2 Foundry with a yearly turnover of four times needs capital of $494,250.00. On $25,000 capital invested in equipment no bank would loan either of the amounts needed on such security. The only thing that I see could be done is to go to some of those usurious loan sharks or bootleggers to raise it. Or float a company and use those figures in my prospectus, the same as I am told they do in all foundry promotions. It's a great idea, but let's forget it until we have looked over your constructive plan.

Quoting Mr. Churchill's Plan as outlined in the last paragraph of the second column of Page 418 of the November issue of the METAL INDUSTRY: "Suppose a 25-man foundry arbitrarily decides that its accumulated experience, skill and ability is worth $25,000 net profit. . . ." If the entire force consists of 25 men and the average man time per year should be but two-thirds of the full normal. . . . In the foregoing illustration to make $25,000 per year the total yearly expenses for payrolls and all charges except actual material purchases might amount to $50,000, the profit ratio to actual cost would be 50%."

In the following illustrations from the two extreme cases cited by Mr. Churchill, you will notice we have deducted all burden. Under the term of Burden as we use it, we assemble interest on the capital necessary to be employed, the amount to be added to cover cash discounts, allowances, and lost accounts that our experience has proven to be necessary in the safe conduct of our business, and lastly the ratio of profit that we desire and consider consistent. As each of the productive labor classifications is variable in relation to one another through the great variations in the patterns a jobbing foundry has to work from, we place the burden directly on the classified division of the service rendered, and assemble them to make the casting price per pound.

Now take Mr. Churchill's No. 1 Foundry making 16 lbs. per day per man, employing 25 men for 200 days per year which equals 80,000 lbs. of castings per year. The cost of molding is $2.00 per lb., melting 8c. per lb. which equals $2.08 from which is deducted the burden of 20% which is figured by me to compensate for lost accounts, interest on investment, and profit. This would leave a conversion cost of $1.67 per pound for

80,000 lbs. or a cost of	$133,600.00
Cost of Alloy (no burden) 17.22c. per lb. for 80,000 lbs.	13,776.00
This makes a net total cost of castings	$147,376.00

A capital of $147,376 would be needed for the year which at a turnover of four times per year would be reduced to $34,344. Interest on this amount at 6% would be $2,064.-64. Deduct this interest from the predetermined profit of $25,000 which leaves a net profit of $22,935.36. Add the $25,000 to the net cost of castings making the gross sales $172,376. If you divide the gross sales into the $22,935.36 this will show a gross profit of 11½%. But as stated above, no provision is made for lost accounts, discounts or interest on the investment. "Pretty good."

"But wait until you see proof sheet of No. 2 Foundry" that runs exclusively on 50 lb. castings at an output per day per man of 800 lbs.; with 25 men for 200 days this makes a total output per year of 4,000,000 lb. We use a price of 4c. per pound for molding and 6c. per pound for melting one and a half pounds of metal for every pound of castings SOLD which gives a total cost of 10c. per lb. for molding and melting. Deduct from this the 20% charge for burden which leaves a net cost of 8c. per pound or a conversion cost

for 4,000,000 lbs. at 8c. per lb. equals	$320,000.00
for 4,000,000 lbs. cost of alloy at 17.22c. per lb. equals	688,800.00
which gives a total cost of	$1,008,800.00

A capital of $1,008,800 would be needed for the year which at a turnover of four times per year would be reduced to $252,000. Interest on this amount at 6% would be $15,132. Deduct this interest from the predetermined profit of $25,000 which leaves a net profit of $9,868. If you add the $25,000 for predetermined profit to your conversion and metal costs of $1,008,800 it will give you a gross cost of $1,033,800 for the year's output. If you divided the gross sales into the net profit amounting to $9,868 you will find you have a profit of .009439% or less than 1% profit, and nothing for discounts or lost accounts, etc.

Those two proof sheets show that Mr. Churchill's budgeted total conversion costs of $50,000 are insufficient. It also shows that when a budgeted amount of profit of $25,000 for 25 molders and their help goes beyond the ratio of pounds output per day that has been established it does not automatically provide for the increased amount of metal to be melted to meet the increased output as shown in proof sheet of No. 2 foundry by increase in conversion costs. It does not provide for increased amount of coremaking that may be necessary by reason of the differences in patterns to be used to make castings from. It does not provide for the increased interest that is shown to be necessary with increased value of output as shown in proof sheet of No. 2 foundry. It does not provide for increased loss through cash discounts, allowances, or lost accounts due to the increased value of output. And it does not provide for any **increased profits** for **increased service rendered.** It might operate successfully in a paper or pulp mill with a single product and definite amount of product per day. But for a jobbing brass foundry with all its variations in cost and value of output it would need very many modifications, elaborations, and frills to make this principle useful or acceptable to project prices from.

The ideal cost system to use to project prices from is the one that includes the following principles: Wherever a **concern employs** their **accumulated experience, skill, ability, capital** or **credit** to **render service** to their **customers** it will give them what they are entitled to—a **profit** on all of the **service rendered,** and, according to the Western saying, thus be able to conduct their affairs so that they can look any man in the face and tell him to go to——.

By using the cost system as published in the October issue of the METAL INDUSTRY to compile your costs for 1922, you can, from that compilation, project your prices for as long a period as there is no change in labor rates, manufacturing merchandise, or overheads. Where such a change occurs you can reassemble your cost to take care of the changed conditions that will make the prices higher or lower. You will have a price making system for your sales and budgeting system for your costs that will run true to form if adhered to strictly. You will be able to conduct your business honorably towards your customers, your creditors, yourself, and your competitors as we have been able to do for the past twenty years.

Locomotive Brasses and Bronzes

The Effect of Superheated Steam on Non-Ferrous Metals Used in Locomotives*

By SIR HENRY FOWLER, K.B.E., Member (Derby)

At the time when Mr. George Hughes[1] read his very full and comprehensive paper on non-ferrous metals in locomotives, superheated steam was not employed to any great extent. Since that time its use has very much extended, and now it may be said that no new locomotive is built without being arranged to use superheated steam. The temperature of the steam as it leaves the superheater is usually about 340° C. It must not, however, be taken that the various parts of the mechanism which are referred to in this Note are all constantly at this temperature, because the steam in contact with some of them is expanded, with a resulting considerable fall in temperature.

The following is the experience and practice with regard to the chief parts that are subjected to superheated steam in the case of superheated locomotives on the Midland Railway.

PISTON TAIL ROD BUSHES

These are the bushes through which the tail rods of the pistons slide, and thus support is given to the piston. The tail rods are 2⅜ in. in diameter, the bush being 7 in. long and ⅜ in. in thickness. The tail rod is enclosed in a casing which is open to the cylinder. The bush is smaller in diameter than the inside of the casing for about 6 in. of its length, and therefore has a space around most of its outer surface. The flange at the cylinder end and a portion of the bush which extends into the casing is exposed to the superheated steam during one stroke, and to exhaust temperature on the return. Originally these bushes were made of M.R.A. 1 gun-metal, having the following composition:

	Per Cent.
Copper	87
Tin	9
Zinc	2
Lead	2

This metal was found to break in service, but unfortunately as this was some years ago none is now available, and no photomicrograph was taken.

The gun-metal was replaced by cast iron, which however was found to score the rods. Recourse was then made to a phosphor-bronze of the following composition:

	Per Cent.
Copper	88
Tin	11
Phosphorus	1

and this has been running for over six years in a number of engines with satisfaction.

PISTON-ROD PACKING

At the other end of the cylinder is fitted a gland of the U.K. type of metallic packing containing what are known as McNamee rings. The McNamee rings are two thin rings lying side by side in a case which does not touch the rod itself. The rings are in halves, and on their outer surface have grooves in which spiral springs are placed to keep them together and close on to the rod. The object of these rings is to prevent the steam coming directly in contact with the white metal in the gland proper. From analysis the composition of the metal of which the rings are made appears to be as follows:

	Per Cent.
Copper	75.5
Tin	8.5
Zinc	0.33
Phosphorus	trace
Nickel	0.5
Lead	15.0

With the exception of the above and the white metal packing rings, all the parts of the gland are made of gun-metal alloy. The white metal packing rings are of the following composition:

	Per Cent.
Lead	70
Antimony	30

This has been found more satisfactory under the conditions used than the usual 80:20 lead-antimony alloy. The 70:30 mixture is cast roughly into the shape of the rings in open-top iron moulds, care being taken to see that the casting temperature is between 425° C. and 450° C.

During solidification the metal is pressed into the mould by means of a flat piece of wood, as this has been found to give metal of greater soundness. The fracture of this metal is coarsely crystalline, and its microstructure is shown by Figs. 1 and 2 (Plate I.).

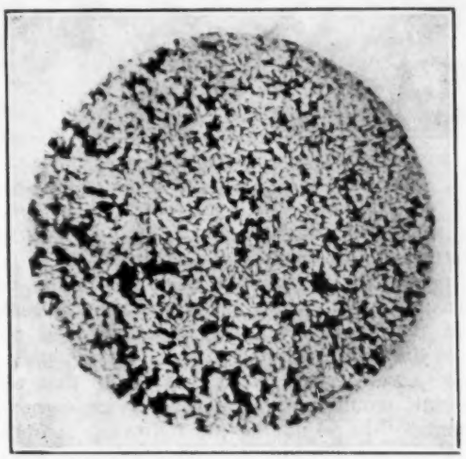


FIG. 1. PISTON-ROD PACKING
70-30 Lead-Antimony. 10 Dia.

An interesting point about this metal is that although it has worked for about twelve years and gave the utmost satisfaction, apparently the temperatures met with, say, 340° to 370° C., are approaching its critical point, as an increase above this figure has been found to cause trouble. This was experienced during the coal strike of last year when a number of engines were fired with oil in place of coal, which was found to give a higher degree of superheat, the temperature rising to 425° C. The trouble experienced was due to the packing rings fusing. It will be appreciated that the full heat is only on these parts intermittently.

PISTON VALVE FITTINGS

The valve spindle packings are similar in design to those for the piston rods but of a smaller size, and the same metals are used throughout satisfactorily, although in this case they are subjected to superheated steam dur-

[1]Journal of the Institute of Metals, No. 2, 1911, vol. vi. pp. 74-120.
*A paper read at the Swansea Meeting of the British Institute of Metals, September 20-22, 1922

ing the whole of the time the engine is working. The bushes for the ends of the valve spindles are made of M.R.A. 1 alloy, which has been found to give satisfactory results. This is interesting in the light of the experience referred to above with regard to bushes for the piston tail rods.

The nuts which secure the valve heads to the spindles are of the M.R.A. 1 alloy already given, and are satisfactory; there is, of course, no work on them.

CYLINDER RELIEF VALVES

These are placed at each end of the cylinder, and are made of M.R.A. 1 alloy.

BY-PASS VALVES

These valves, which are arranged to close communication between the ends of the cylinder when steaming, are

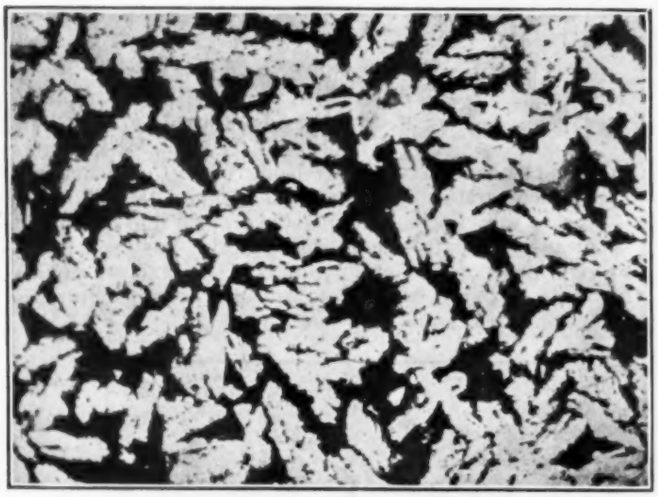


FIG. 2. PISTON-ROD PACKING
70-30 Lead-Antimony .50 Dia.

subject to a good deal of shock, and of course to the temperature of the steam in the cylinders.

Originally they were made of good quality cast iron, but it was found that the wings were liable to break. Gun-metal of the M.R.A. 1 gun-metal alloy and phosphor-bronze of the compositions referred to previously for tail-rod bushes were tried, but it was found that neither of these metals would withstand the service demanded. A complex nickel-brass having the following composition:

	Per Cent.
Copper	53.86
Tin	0.88
Lead	0.43
Aluminium	0.38
Iron	2.31
Manganese	0.84
Nickel	3.33
Zinc	38.05

was then tried with successful results, but on the question of cost was replaced by malleable iron or steel castings.

These are the chief parts used in a locomotive that are subjected to superheated steam, and it would seem from the experience above recorded that a metal which may prove satisfactory when not subjected to friction, may be wholly unsuitable when it has a moving part working over it.

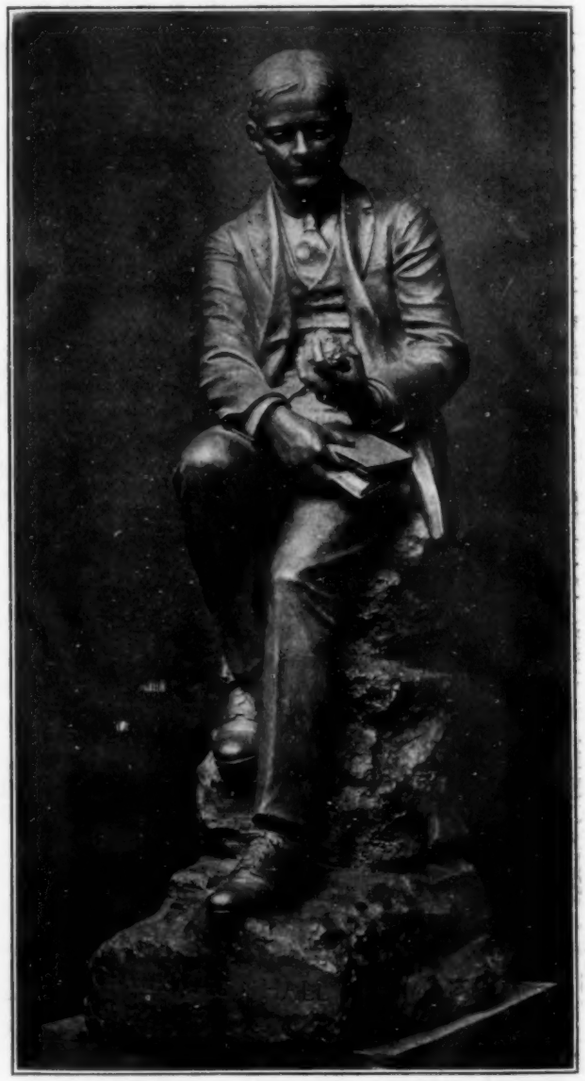
Drawing Thin Sheet Brass

Q.—We are having trouble in drawing thin sheet brass in the power press. We are obtaining a good draw on the goods but have a large percentage of split or spoiled work.

A.—This result is often traced to extra hard or brittle material and it is sometimes necessary to anneal the stock before proceeding with the drawing operation.

When the blank is large in relation to the diameter of the draw, it is usually advisable to relieve the outer portion slightly so that the die opening has only a slight bearing on the blank holder.

In addition, the draw will be easier if the die is stoned radially with a fine stone or a piece of fine emery cloth carrying the process over the rounding edge of the hole. You will get good results when the corner has the shape of the broad side of an elipse rather than a true quarter circle.—P. W. B.



STATUE IN ALUMINUM OF CHARLES MARTIN HALL.

Aluminum Statue of Hall

A statue of Charles Martin Hall, the inventor of the process which made aluminum a commercial metal is on view in the Carnegie museum, Pittsburgh, Pa. This is said to be the first aluminum statue ever made. Several bas-reliefs have since been cast, also of aluminum. The statue is five feet nine inches high.

The sculptor is G. Moretti, 4029 Bigelow Boulevard, Pittsburgh, Pa.

Cobalt Tungsten Alloys

Some Physical, Chemical and Electrical Properties of This Mixture*

Translated for The Metal Industry by R. E. SEARCH, Exchange Editor

It is well known that the only alloys of tungsten that are of practical value are those made with platinum, chromium and some of the other members of the iron group of metals. While the alloys of tungsten with iron and chromium are extensively used, the cobalt-tungsten alloys, up to the present time, have aroused scarcely any interest.

The data for the points of the cooling curve, given here, was obtained by melting 120 grams of the alloy. Tungsten powder and cube cobalt containing impurities to the extent of about 0.23 per cent of silicon, and 0.24 per cent of carbon; 1.54 or 0.125 per cent of iron and traces of nickel. The melt was made in a Helberger electric resistance furnace, and the crucible used was lined with magnesite. The cobalt cubes were melted first and the tungsten powder was stirred into the molten cobalt with a quartz rod. The result was good and with but little loss by burning. The shrinkage surface of the cold bar was sharply convex. It pressed the thermo-couple out so violently that special precautions had to be taken in order to prevent contact of the protecting tube with the magnesite lining. The results of the cooling curve—see Table 1, was always controlled by means of the heating curves. The metallographic investigations (no micrographs shown) of the product confirmed and completed the results of the thermal analysis.

The various groups of alloys may be distinguished as follows:

1. From 0 to 40 per cent tungsten the alloys show a mixed crystal structure. 2. From 40 to 45 per cent tungsten the alloys show a compound in place of the mixed crystals. 3. From 45 to 70 per cent tungsten the alloys show a compound in place of the mixed crystals. 4. From 70 to 80 per cent tungsten the alloys have an unstable structure and denote the appearance of an over-lapped maxima. (See Guertler's Metallography, I. 1.p 283). 5. Tungsten alloys over 80 per cent include compound primary crystals (tungsten-rich mixed crystals) in a homogeneous matrix.

TABLE 1.

No. of melt.	Tungsten %	Temperature at beginning of the crystalization.	Temperature of of the eutectic crystalization.
1	0	1489	....
2	9.08	1492	....
3	13.98	1496	....
4	25.0	1495	....
5	29.8	1501	....
6	39.7	1490	(1480)
7	45.2	....	1483
8	54.4	1568	1481
9	61.0	1606	1478
10	73.9	(1634?)	1481
11	78.6	....	1479

The accompanying phase-diagram was based on the data derived from these tests. According to the sketch, cobalt and tungsten form solid solutions on both sides of the diagram. The field of the cobalt-rich mixed crystals and with it also the tungsten-rich crystals are considerably extended. A compound, CoW, appears with 75.82 per cent W and perhaps also Co_6 W or 34.2 per cent Co. CoW forms a eutectic with mixed crystals of tungsten at 39 per cent concentration; there is also an overlapped maximum in the shape of tungsten-rich mixed crystal. The eutectic point is probably at 44.5 per cent tungsten. Eutectic temperature is found on the line of 1480 deg. C.

It was difficult to make the alloys. At first a Borchers electric arc furnace was tried; the charge consisted of incandescent cobaltic oxide and calcium oxide free from carbon, molten cobalt deoxidized by magnesium. The cast bar was useless. In the cold state gas escaped from its pores and filled the interior, while cooling, with blisters. Also the bars held in solution, up to 1.6 per cent of the protoxide. A nickel-magnesium alloy used as a refining agent proved to be worthless. Finally by the alumino-thermic method and using a cobaltic-titanide with about 15 per cent of titanium as a deoxidizer, sound castings were produced. (Please note the foundry practice involved here and make a note of it, as it is not often referred to in German technical papers). A number of experimental castings showed that an addition of about 4 per cent of titanium was enough completely to deoxidize the material and that about 0.1 per cent of titanium remained in the casting. Later cerium was substituted for titanium as a deoxidizing agent, but the reaction was incomplete, the metal remained full of gas-blisters. After this attempt the bars were refined only with titanium.

All of the bars showed considerable hardness. Above 10 per cent of tungsten the alloys reached such a hardness that they could be worked further only by grinding them into a desired shape. The hardness increased up to about 75 per cent tungsten. The alloys belonging to the mixed crystal region showed considerable toughness, but with more than 45 per cent tungsten, in increasing ratio, up to the appearance of the corresponding compound, that is about up to 75 per cent by weight, the alloys became brittle. At the same time a grain growth appeared that reached a maximum with an alloy of about 68.7 per cent tungsten. The brittleness at this concentration was so great that the metal could not be polished by an emery disc without framing the specimen in, otherwise the grains would be torn out of place in the act of polishing. By further increasing the tungsten both the grain size and the brittleness decreased, but even then the alloys could be powdered in a steel mortar, without difficulty.

It followed then from these experiments that high tungsten alloys have no technical importance and the low-tungsten alloys could not be worked with cutting tools, therefore ten per cent tungsten alloys was chosen as the practical limit of usefulness.

The sand-cast bars were tested as to their electrical conductivity, Brinell hardness, resistance to rupture, and capacity for cold rolling.

In remelting care must be taken to avoid overheating to escape the danger of porousness. A previous alloy of 24 per cent tungsten was prepared from which the lower type of alloys were made.

The electrical conductivity values were measured according to the voltage method. The specific resistance given in Table 2 is 10^4 times the resistance of a cubic centimeter, which is denoted by q. It denotes the resisttance of a bar one centimeter by 100 sq. mm. cross-section.

*From the Cobalt-Tungsten Alloys, by Dipl.-Ing. Karl Kreitz. Abstracted from Metall und Erz, 22 March, 1922, pp. 137-40.

TABLE 2.

Tungsten %	Iron %	Specific resistance equal $\delta . 10^4$	Conductivity $\frac{1}{\delta} . 10^4$
0	0.61	0.0980	11.03
0.95	0.56	0.0375	7.27
2.15	0.7	0.1905	5.25
3.02	0.68	0.2270	4.30
4.64	0.5	0.3130	5.32
9.70	0.62	0.4450	2.25
12.10	0.6	0.8060	1.98
24.15	...	0.7145	1.40

The resistance to storage-battery acids—1.18 sp. gr. at 20 and 98 deg. C.—and also against artificial sea water. The sea water was composed of a 2% solution of common salt heated to varying temperatures up to 100 deg. C. to which was added a 5% solution of nitric acid as an oxidizing agent.

The Brinell hardness was made with a 5-mm ball. Three impressions with 500, 750 and 1,000 kilogram loads were made and the average of the three values was taken as the value found.

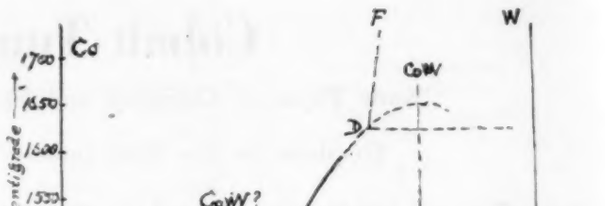
TABLE 3.

Tungsten %	Solubility in Storage—battery acid. Milligrams per square millimeter, per hour at 20 deg. C.	Milligrams per square millimeter, per hour at 98 deg. C.
0	0.000065	0.0154
0.95	0.00025	0.176
2.15	0.00072	0.84
3.025	0.00135	1.203
4.64	0.0012	1.055
5.02	.....	1.09 mean for 5%—1
4.85	.....	0.985
9.75	0.00061	0.29
12.01	0.0003	0.098

TABLE 4.

Tungsten %	Solubility in 2% NaCl plus 5% HNO_3.98 deg. Milligrams per sq. mm per hour
0	0.0482
3.025	0.334
5.02	0.406
12.01	0.736

Experiments were also made with some cold rolled specimens. With these the hardness rapidly increased.



PHASE DIAGRAM OF THE COBALT-TUNGSTEN ALLOYS.

TABLE 5.

Brinell Hardness of the Co-W alloys.

Tungsten %	Brinell Hardness number.
0	185
0.95	188
2.15	196
3.02	202
4.64	214
9.70	282
24.15	288

In a reduction of 12 to 15% the Brinell hardness reached from 300 to 350.

By varying the heat to a softening temperature,—above 1,200 deg. C.—and rolling, it was nevertheless possible to roll out plates from the investigated alloys.

Tungsten seems to increase the hardness considerably and also the resistance to rupture of the cobalt alloys within the limits allowed in this investigation, also to increase its electrical resistance. But, as to its resistance to sea water it exerted an unfavorable influence. The resistance to sulphuric acid decreased until the alloy contained about 3% tungsten, which then increased greatly; no explanation could be found for this anomaly. In a hot state the metal could be forged and rolled only to a slight degree. The alloys may be cold-rolled with great difficulty. The most important properties of the alloys were found at a concentration of about 10% of tungsten.

Casting Aluminum Alloys

Q. We are casting a special aluminum alloy of our own composition but to date we have not had the success that we desire. We would consider it a great help and favor if you could answer any or all of the following questions:

(1) What is a good coating to put on a brass or gray iron chill to free the aluminum alloy casting after being poured?

(2) What is the best sand facing for aluminum alloy castings?

(3) What are the formulæ for a first and second dip for aluminum alloy castings which are to be buffed or polished?

A. (1) We suggest that you try French chalk. Mix it with a small amount of turpentine and water.

(2) The best sand facing for aluminum alloy castings is Windsor Lock sand.

(3) It is difficult to decide just what acid dipping solution will be best adapted for your aluminum alloy castings, as no mention is made of the alloy. Ordinary aluminum is cleansed in strong caustic soda solution—8 to 12 ounces per gallon of water, at 160 to 180 deg. Fahr.

After washing thoroughly, the castings should be immersed in undiluted nitric acid 38°, for a moment until the black aluminum oxide formed in the caustic soda solution is reduced and the aluminum becomes of a pure white satin color.

After acid dipping, wash thoroughly in cold and boiling water, and dry out by the aid of hot maple wood sawdust.

If the aluminum alloy is of a nature that a bright acid dip can be used following the above operations, then a bright acid dip such as that used in bright dipping of brass goods may be made use of, following the nitric acid dip.

Bright Acid Dip.

Sulphuric Acid 66°	1 gallon
Nitric Acid 38°	1 "
Water	1 quart
Muriatic Acid	1 ounce

Mix thoroughly and allow to cool to normal temperature before using.

To keep continually cool place the receptacle in cold running water.—W. J. R., C. H. P.

Inventions, Inventors, Patents

Difficulties Involved and Obstacles to Surmount in Dealing with These Three Graces

Written for the Metal Industry by WILLIAM H. PARRY, Foundryman

Many mechanics, and some who are not so afflicted, will at some period of their lives become obsessed by a conviction that their inventive and creative ability is so far superior to the ordinary run of mankind, that they must needs apply for a patent so as to protect the product of their brilliant minds. Many believe that the mere granting of a patent by the authorities of our Patent Office at Washington is of itself the beginning of an era of prosperity for the patentee, when, as a matter of record, it very often works the other way.

Men with peanut roaster minds will waste a lot of time trying to perfect the impossible; such for instance, as "Perpetual Motion," which, being freely interpreted means, a device or machine that will, without help, generate more than sufficient power to overcome its own friction, and, have enough left to make the possibilities of Niagara Falls as a power source seem insignificant in comparison. Others will spend a lot of their own time and other people's money on inventions that may have considerable merit, but for which there is no demand or need even after a vast amount of capital has been wasted in an attempt to create a market. Not but what markets have been created, and will be, but it takes a lot of brains and money to convince the buying public that a certain article is as necessary to life as the meals they eat.

Perhaps the meanest form of invention is that practiced by large corporations whose experimental forces are always active in so completely covering their field with patent applications that pour into the Patent Office, not so much for the sake of using the patents granted, as it is to prevent any aspiring genius from getting ahead of them in the race for a monopoly. Some day our people will awake to the iniquities of this all too prevalent practice and demand that laws be enacted to compel these grasping corporations to market inventions in a certain specified time after patents are granted, or forfeit their right to do so.

It may be news to many men who nurse an ambition to shine as inventors, that about 95% of all patents granted in this country have not in the past brought enough money to the pockets of the men who originated the ideas, to pay for a slim meal in a beanery.

One of the most ingenious inventions I ever saw was invented by a young patternmaker from Cincinnati. It was a machine for weaving fish nets of any mesh within the limits of the machine. He interested capital to the picayune amount of five hundred dollars, which, thirty-five years ago was a fair amount to capitalize a new toothpick venture or something of that sort, but not a complicated weaving machine. The five hundred "bucks" did not last long enough to pay for the set of patterns; the backers got cold feet then and there, and refused to come across with addition of capital which left the inventor stranded, and, as he had assigned two-thirds of his patent rights to the spendthrift backers, he was tied hand and foot, and had to seek a job at his trade so as to satisfy an inventor's appetite, which, contrary to popular belief is very robust.

One of the most brilliant minds along mechanical lines, Alexander Campbell, the inventor of the book printing press of that name, once told me that while walking along a country road, he met a farmer driving a wagon, the body of which was tilted up from the rear end pointing forward to an agle of forty-five degrees. This necessitated the binding of the load with ropes to keep the bags of potatoes from decorating the roadway and pelting the farmer on the way down.

It was such an unusual sight that Campbell asked the farmer the reason for cocking up the wagon body. He was told by the originator of that scintillating idea that by doing so, it was easier on his horses **(the weight being cut in half).**

Campbell then suggested that if the body of the wagon were raised to a vertical position, he could dispense with the horses altogether, that is, if the farmer's reasoning was correct.

As this little incident actually happened over seventy years ago, and all wagon bodies are placed in a horizontal position, or near it, today, it is safe to assume that the farmer-inventor's reasoning was a little faulty.

Again, many inventions, while patentable, are not practical in the sense that they can be put to any good use, and men who in all other respects are sensible, display mighty little common sense in wasting their own and other people's time and money on inventions that cannot possibly have any practical value.

A case in point will serve to illustrate what is meant by no practical value. An inventor of lithographic presses whose success as such was the talk of the town, was not satisfied to confine his inventive ability to that field alone, and, conceived an idea of keeping the iron tires on truck wheels (this was many years prior to the automobile age), by a rather complicated mechanism located in the hub of the wheel, which, being operated by a specially designed wrench, forced the wheel spokes to act on the felloes, which in turn bound the tire in place and held it there until it needed another tightening. A truck was equipped with four of these wheels, and the inventor with a half a dozen friends made up the load to try out its staying qualities. As the pavements of those days were of the cobblestone variety on about ninety-nine per cent of the streets of Williamsburgh, L. I., where this trial took place, the truck had not proceeded a half a mile, when the unearthly groans and squeaks, emanating from every wheel indicated that something was radically wrong. And so it proved, when the truck was brought to a state of rest, for inspection. Every spoke, felloe, and tire was loose, and, had not the truck been brought to a standstill then, the chances for a complete collapse of all of the wheels in another minute or two was excellent. Theoretically, this invention passed muster, but, when we consider that the spokes of this wheel had to be loose in the hub to operate at all, and that at that time and today, spokes are either driven into a wooden hub, or clamped and bolted in a steel one, in the effort to counteract the shocks all truck wheels must stand, the reason for the failure of this invention is made plain. Yet the inventor insisted that it could be made to work with a few changes, a view with which his backers did not coincide, as they tightened their grip on their bankrolls, just about that time.

Some inventors are unfortunate in having patents granted to them for really meritorious devices, at a period when some other inventor is granted letters patent for devices along the same lines, and, either through being cheaper to manufacture, or better handled financially, relegates one of the inventions to that limbo from which there is no returning. Such, for instance, was an invention for "power braking" the wheels of railroad trains, for

which a Canadian was responsible. His method was unique, and very practical, in that the engineer could control his train of cars and throw on the brakes, by simply shutting off his steam power, thus throwing the work on cushioned bumpers at the end of each car, which provided the necessary power to operate the brakes on every wheel, by their impact on one another.

There is no question as to the complete success of this principle in railroad braking. But what happened? George Westinghouse came along with his compressed air brake, and put the skids under the Canadian's invention.

It must be remembered, however, that all was not plain sailing, even for Westinghouse's air brake. While the original patent was granted in this country in the late sixties, the device was not put to almost universal use until after the expiration of the original patent period of seventeen years. But, as many improvements were made by the inventor in the meantime, the monopoly to manufacture was held by him and his company.

To be a success as an inventor means much more than the mere ability to invent. The discouragements and rebuffs encountered will try the patience of a stoic, and the courage of a bulldog. If he is not the happy possessor of both of these attributes his road is going to be a rocky one, no matter how talented he may be. Many penniless inventors are not willing to assign a fair proportion of their patent rights to those willing to furnish the "sinews of war." This is, of course, a great mistake, as, without money to pay the necessary fees for the patent grant, which involves remuneration for the patent attorney, if the inventor or his friends are not able to make the necessary drawings, write up the application, petition, specifications, claims and oath, no patent worth a rap can be obtained.

Prospective inventors are advised to procure a copy of the book published by the Department of the Interior, entitled, "Rules of Practice in the United States Patent Office," which can be had for the asking. This provides all the necessary information bearing on this subject. In it he will find two hundred rules plainly set for the guidance of those about to seek letters patent, and, while it is not expected that one reading of this book will make a patent attorney out of even the most learned of men, it is very helpful to the uninitiated, if only it fits his mind to the requirements and qualifications necessary to the granting of patent rights.

Die Castings for Plumbing Work

Written for The Metal Industry by PETER W. BLAIR, Mechanical Editor

The die-casting process offers many opportunities for reducing manufacturing costs when the metals from which die-castings can be made are satisfactory for the parts required. By the die-casting process, holes, recesses, etc., can be cast directly in the part with such accuracy that in most instances machining is unnecessary.

Even the first cost of the dies is negligable as compared with the first cost of the machining operation equipment that would be necessary or required. There is also the saving in pattern plates and core boxes.

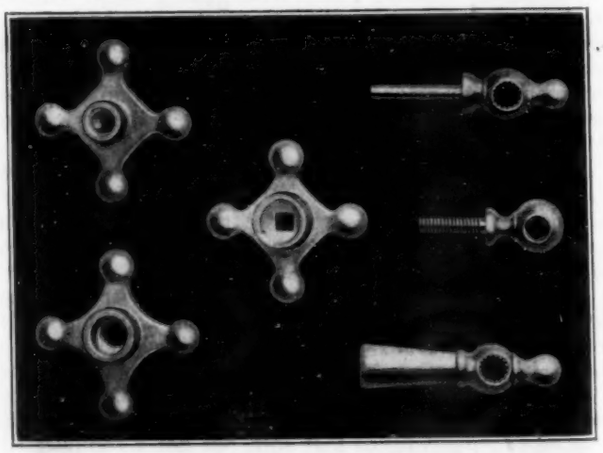
Many manufacturers of specialties have found that not only is it possible to start a business for the manufacture of a new article with less capital when the die-casting process is employed, (as the dies are cheaper than machine tool equipment), but it is also possible to get under way faster as dies can be made in a fraction of the time that cast patterns, core boxes, tools and machines can be fitted up.

The manufacturing of the article then reduces itself mainly to an assembling proposition and to the machining and making of such as cannot be die-cast.

The illustration shows a four-arm index handle used on basin and bath cocks also bibbs. This is an expensive handle to cast and machine from brass. There are six machining operations performed on this handle before it is complete, and to prepare it for nickel-plating it has to be polished and buffed. It is an expensive item to manufacture from cast brass or the forging process.

This four-arm handle costs as delivered by the die-casting company 60 per cent of what it costs when made from brass. This includes the cost of dies distributed over a period of six months. These die-cast four-arm handles are made from a Zinc Base alloy having a tensile strength of 24,000 pounds per square inch. The composition is 88 per cent zinc, 4 per cent copper, 6 per cent tin and 2 per cent aluminum. The counterbores on each end and the surfaces come so accurately from the dies that no further work is necessary than that of buffing and nickel plating.

Handles made in this manner have been tested out under severe wear for the past year and have been found to be fully as satisfactory as brass handles. In fact they have some advantages over those made from brass. They will take a heavier plate of nickel and will therefore wear longer. In a public lavatory where there is a battery of wash-basins equipped with this or any other style or design of handle, owing to the heavy wear through continual use of them in operation, the nickel plate wears off. The red or yellow brass shows up badly and spoils the appearance of all the fittings.



EXAMPLES OF DIE CAST PLUMBING

Should the nickel-plating wear off the die-casting, the metal will not show a red or yellow brass color, owing to the fact that the die-cast metal is white.

The illustration shows a lever handle which is made up in solid metal or designed for porcelain index.

These handles can be delivered at a cost less than 5 cents including the cost of dies distributed over a period of six months. No machining is required on these handles as they are delivered ready to assemble.

The illustration shows a knurled wheel handle which is an expensive machining operation as it is machined on the top and bottom sides. They are used on lavatory stops.

Dezincification of Brass

Experiments on the Mechanism of Corrosion, Part 1.[1]

By RALPH A. ABRAMS, University of Wisconsin

ABSTRACT

Experiments are recorded, the results of which indicate that the mechanism of dezincification appears to be as follows: The first step is the dissolving of the brass as a whole. The copper in solution then redeposits replacing brass as a unit. This redeposition will not take place unless there is some means of holding the dissolved copper in contact with the brass. This can be accomplished in two ways, one by the presence of a membrane, the other by having a large excess of dissolved copper present. Obviously this latter possibility is a remote one, especially so far as natural conditions are concerned. The membrane may be anything whatsoever, so long as it performs the function of keeping the dissolved copper in contact with the brass. Whether or not dezincification shall take place can be controlled by merely supplying or taking away the membrane. Briefly then, the dezincification of brass is the dissolving of the brass as a whole, the holding of the dissolved copper in contact with the brass by a membrane, and the subsequent redeposition of the copper.

The subject of the dezincification of brass has been one of current interest for many years to students of the corrosion of non-ferrous alloys. This corrosion has been studied from almost every conceivable point of view, in an effort to throw light on its actual mechanism. Dezincified brass is commonly understood to mean brass which, after undergoing service for a period of years, has so disintegrated under the influence of sea water that only a porous mass of seemingly metallic copper with a brass colored coating on the surface remains. It is really brass minus the zinc, and minus those physical qualities which make brass valuable. This product of corrosion is weak, brittle, and fills under the slightest stress.

In using the word "dezincification" in this paper, it is to be understood to mean brass which has undergone the corrosion above described, regardless of what the actual process of this corrosion has been. The question of dezincification has been one of vital import to users of brass condenser tubes and other brass parts which are subject to the action of sea water. It was perhaps the distress of the maritime users of brass that spurred the efforts of men of science to find the real cause of this action. As has been said, the question has been attacked from all sides. It may prove interesting to review a few of the more prominent ideas advanced. Mr. Arnold Philip, admiralty chemist, Portsmouth,[2] believes in the existence of "minute zinc-copper couples, functioning as small electrical cells, all over the surface of the brass." He called attention not only to molecular couples of copper and zinc, but also to molecular couples of compounds of copper and zinc. The action of such couples results, he believes, in the dissolving out of zinc and leaving copper behind.

Mr. Samuel Whyte and Dr. Desch concur in the idea of a couple action between the **alpha** and **beta** constituents of brass. Their idea agrees well with the statement of Mr. Rawdon.[3]

"The preferential attack of the **beta** phase is to be attributed to its higher zinc content, which renders it more electro-positive than the copper-rich **alpha** constituent. When an electrolyte is present, electrolysis occurs either by means of the application of an external e. m. f., by contact with some metal that is less electro-positive than the alloy, or by reason of the electrochemical difference in potential between the **alpha** and **beta** phases. The **beta** is always attacked first; its zinc largely passes into solution leaving behind the porous copper masses occupying the spaces initially filled with the **beta** matrix. This type of corrosion may be regarded as electrolytic leaching out of zinc."

A different opinion is presented by Dr. Bengough and Dr. Hudson in the fourth report of the British Corrosion Committee of the Institute of Metals.

"The provisional view of the present authors as regards 70:30 brass is that the normal action in ordinary types of neutral or nearly neutral water is predominantly one of oxidation, and that the action of couples if such exist is too seriously hampered to be effective. . . It does not appear to the authors absolutely certain, however, that any copper is left **in situ** when zinc passes into solution; what appears to be left may really be redeposited."

An extract[4] of the fifth report by the same committee was published a few months ago. In this, from a study of the corrosion of copper, it is concluded as follows:

"Also that the first action of the corrosion is upon a thin oxidized coating rather than upon the underlying metal. Now if a piece of smooth copper be immersed in chloride solutions, the oxidized surface gradually changes into an almost insoluble cuprous chloride (CuCl), which is ordinarily swept away by gravity or by water currents, but which may adhere to the surface. In the latter case cuprous chloride becomes oxidized according to the reaction.

$$4CuCl + O = Cu_2O + 2CuCl_2$$

into cuprite crystals and the very corrosive soluble cupric chloride. It is easily proved that cupric chloride is very corrosive to copper.

$$CuCl_2 + Cu = 2CuCl$$

and the end product is where we started from. Therefore the reactions occur in cycles at spots underneath the gelatinous salts permeable to oxygen in solution.

"Brass in chloride solution acts similarly. As noted before, the first attack gives a layer of copper oxide, plus a little zinc oxide, the zinc mainly going into solution as $ZnCl_2$. The reactions on the copper then proceed as outlined just above. If the insoluble chlorides adhere to the surface, cupric chloride is formed. Cupric chloride attacks zinc as well as copper,

$$CuCl_2 + Zn = ZnCl_2 + Cu$$

with the formation of a soluble zinc chloride and the deposition of crystalline or powdery copper."

It was in view of this diversity of opinion and because of the widespread interest in the problem that the present investigation was undertaken.

The great difficulty in attempting to study the actual mechanism of the so-called dezincification of brass is that under natural conditions the process requires several years. In the short time available for these experiments, it was therefore impossible to reproduce this corrosion by the mere immersion of brass in artificial sea water. Hence the problem was to hasten the action without distorting the results. Dilute hydrochloric acid presented

[1] A paper presented at the Forty-second General Meeting of the American Electrochemical Society, hold in Montreal, September 21, 22 and 23, 1922.

[2] Journal of the Faraday Society, 1915, p. 244.

[3] Tech. Paper No. 103. Bureau of Standards.

[4] Chem and Met. Eng. Feb. 15, 1922, p. 305.

itself as a probable agent to accomplish this. Corrosion by hydrochloric acid ought to be the same as corrosion by sodium chloride except that the discharge potential of hydrogen on brass from a hydrochloric acid solution is far below what it is from a sodium chloride solution. Therefore the action with hydrochloric acid should proceed with greater velocity than with sodium chloride. If this be the only difference in the performance of the two solutions, then the substitution of hydrochloric acid for sodium chloride should not affect the process of dezincification no matter what its mechanism is. This was tested by experiment. It will be well to mention here that the brass strips used in all the following experiments were about one millimeter in thickness, weighed 0.35 gram per square centimeter of area, and had a total weight of about 10 grams.

EXPERIMENT 1

Five brass strips were submerged in separate tumblers of normal hydrochloric acid and covered with glass plates to prevent evaporation. After four weeks the specimens were examined.

Result: In every case when the sample was removed from the hydrochloric acid, the acid not only showed no trace of the characteristic blue color of a copper salt in solution, but it was perfectly clear and colorless. The brass itself showed no signs of corrosion on the surface, except for the appearance of a few small particles of crystalline copper. The specimens were brittle and could be broken by the fingers with ease. Beneath a brass colored surface the specimens were found to consist entirely of copper, in those cases where the corrosion had not gone to completion, there was a layer of brass at the center with layers of copper on either side. In two samples where the corrosion had gone completely through the thickness of the brass, instead of finding one continuous mass of copper, there were two distinct layers of copper which could easily be pulled apart. The surface between them was smooth and flat.

From the above result, the effect of dilute hydrochloric acid in producing dezincification can not be doubted. With this agent at hand with which the problem can be attacked, a systematic study of it can now be attempted. The first question is to show whether this phenomenon is a leaching out of the zinc or whether it must be explained by another theory.

EXPERIMENT 2

Brass strips were submerged in normal hydrochloric acid. The solution was agitated by bubbling air through it.

Result: At the end of 26 hours the samples were completely dissolved. This experiment was repeated four times with the same result.

EXPERIMENT 3

Brass strips were again placed in normal hydrochloric acid. This time a mechanical stirrer was used to keep the acid in motion. In this case no air came in contact with the specimens.

Result The brass again corroded uniformly, both the copper and the zinc dissolving. There was no dezincification. The action was slower in this case than in Experiment 2. In 240 hours approximately 10 grams dissolved. The hydrochloric acid in this experiment was replaced with a fresh solution every 24 hours to prevent an accumulation of dissolved copper. Upon repetition, this experiment yielded the same results.

In Experiment 1, it was seen that if the brass were undisturbed, dezincification took place. In Experiments 2 and 3, with stirring, corrosion was complete, that is, both the copper and the zinc dissolved. If this process of dezincification were one of the selective corrosion of brass, the stirring of the solution would have no more effect than to aid the action. Why then is the dezincification stopped? It must be because the brass is first corroded as a whole and then the copper redeposited. By stirring, the copper was prevented from redepositing, by being washed away as soon as it dissolved. The action in both experiments was the same. The circulation of the solution in both cases hastened the corrosion and prevented the dissolved copper from coming in contact with the brass. It was to prevent an accumulation of the copper that the solutions were renewed daily.

The increased rate of corrosion in Experiment 2 over that in Experiment 3 is accounted for by the fact that the oxygen acts as a depolarizer, removing the hydrogen and hastening the action. Another circumstance which favors the view that the copper has been redeposited is that in Experiment 1 two distinct layers of copper were formed instead of one continuous mass. If the action had been a mere leaching out of zinc, this could not be explained. But if the action is considered as one of redeposition, it can easily be seen that the deposition of copper on both sides of the strip would leave two distinct sheets of copper when all the brass between them was dissolved.

The action of dezincification can thus be described as, first, the solution of the brass as a whole, putting the copper and zinc into solution and then the redeposition of the copper replacing the brass not the zinc alone. It is very significant in this connection to note the following facts which have long been known. The potential of amalgamated zinc in acid solution is practically that of zinc. When amalgamated zinc is corroded by acids only zinc dissolves—a case of true dezincification. The potential of the alloy, amalgamated zinc, is that of the substance which goes into solution, the zinc. So, the potential of brass must be that of the substance which dissolves. The potential of brass is, however, very close to that of copper.

The point to be emphasized here, therefore, is that it is not the zinc which gives the potential to the brass, as the zinc does in the amalgam, nor is it the copper, but the substance—brass itself—acts as a separate entity with a potential of its own, capable of being replaced as a unit. Now ordinarily when copper is precipitated from solution by zinc, the action is so rapid that the deposit is the usual black spongy one. The difference in potential between the copper and the brass is so small that the action is very slow, so that the copper has the chance to deposit in the bright metallic form in which it is found.

In order to secure reasonably rapid corrosion without the use of acid, brass was used as anode with a very feeble current in different neutral solutions.

EXPERIMENT 4

A brass strip was used as an anode in a 3 per cent solution of potassium sulphate with a carbon cathode. The current density was 0.25 ampere per square foot. The time allowed was ten days.

Result: The brass strip was completely corroded. The copper was deposited at the cathode while the zinc formed a precipitate of zinc hydrate in the colution. The experiment was repeated with the same results.

EXPERIMENT 5

A brass strip was used as an anode in a 3 per cent sodium chloride solution with a carbon cathode. The current density was 0.25 ampere per square foot. The time of electrolysis was 14 days.

Result: In this case, only copper was left at the anode. Again the copper left was in the form of two thin sheets which could be pulled apart as in Experiment 1. At the cathode some copper deposited and there was a precipitate of zinc hydrate in the solution. The experiment was repeated with the same results.

This paper will be concluded in an early issue. —Ed.

The Udylite Process

A Controversy About the Merits of Cadmium and Zinc as Rust Preventives

In our September issue, on page 356, we discussed editorially the controversy about the Udylite Process between C. H. Proctor and C. H. Humphries. Both gentlemen have spoken again through the Monthly Review, which is quoted below. However, in order to bring the matter more clearly to mind we reprint the points made on both sides as published in our September issue.

At the last banquet of the Newark Branch of the American Electroplaters' Society, Charles H. Proctor read a paper on Electro-deposition of Cadmium vs. Zinc, which was later reprinted in the June issue of the "Monthly Review." In this paper he devoted considerable space to the Udylite process. His remarks on that process have since caused considerable discussion. They are briefly as follows:

1. The three patents granted to the Udylite Process Company are specific patents and cover the heating of cadmium coated steel and the formation of a rust-proof alloy between the two metals.

2. Cadmium-iron combinations and the electro-deposition of cadmium have been known for a long time.

3. Cadmium and zinc deposits of equal weight will stand the same length of time in the Preece test and in actual atmospheric corrosive tests.

4. The cost of depositing cadmium, if cadmium anodes are used is at least five times as great as the cost of depositing zinc of an equal weight. If insoluble anodes were used the cost of cadmium deposition would probably be as much as ten times the cost of an equal amount of zinc.

5. Therefore, on the basis of dollars and cents, if no other, zinc is a much more desirable rust-proof protective coating for iron and steel than cadmium.

In answer to this paper the Udylite Process Company, through C. H. Humphries, member of the Indianapolis Branch of the A. E. S,. wrote a letter to the Monthly Review, which was published in the July issue. Their contentions were as follows:

1. That although previous work had been done on cadmium plating, which was perfectly well-known to the Udylite Company, this work was not commercial and had not been worked on a large scale as had the Udylite process. Moreover, no one had treated the cadmium plate so as to change its properties chemically and physically, while it was still a part of the article coated.

2. That Mr. Proctor had been guilty of errors, such as inaccuracy in giving the heat treating temperature and the chemical formula for the Udylite solution.

3. That the Udylite Process Company could prove, by microscopic and physical means, that penetration of cadmium into iron and alloying therewith does occur.

4. That Mr. Proctor's cost figures for zinc and cadmium are not correct because they are based on equal thicknesses of metal. The thickness of zinc deposits on tire rims varies from .0004" to .001", while the standard thickness of cadmium is from .00015" to .0002"; also that cadmium is plated much more quickly due to the high current density employed, this resulting in increased output per unit of equipment, floor space, etc.

5. That although the patents call for anodes of metallic cadmium, the process has been put to various uses with insoluble anodes, due to the fact that the cadmium anodes in the solutions containing no free cyanide film over, and the current passing through the bath drops off rapidly.

Electro-Deposition of Cadmium Versus Zinc

BY CHARLES H. PROCTOR

A paper covering the above subject was read before the Newark, N. J., Branch of the American Electro-Platers' Society on Saturday afternoon, April 22, 1922, preceding the fourth annual banquet, at an educational session, and our esteemed editor, Mr. W. J. Allen, presumably thought the paper of sufficient interest to the members of the society at large to print it in the Monthly Review for June without any comment from the writer.

I have read with a great deal of interest the criticism of my paper by the Udylite Process Company, through their representative, Mr. C. H. Humphries, a member of the Indianapolis Branch.

If he had any knowledge of electro-plating under commercial conditions his eyes could certainly not be closed to the fact "That no commercial process of electro-plating can be successful when insoluble anodes are used in the process." I have explained the reasons why in my paper for this contention, I will, however, elaborate further here.

The one commercial factor in any electro-plating solution is metal. Cyanides, hydrates, chlorides or carbonates or any other salt that may be a part of the solution has no commercial value. If a plating solution, irrespective of the composition of the minor salts, is maintained exclusively in operation with metallic salts that exceeds in cost the price paid for the metal as anode per pound, then such a solution is not an economical solution and must reach a prohibitive stage, as I have outlined in my previous paper, when cost is considered as compared with the comparative value of cadmium and zinc as commercial rust-proof factors for iron and steel. Furthermore, such a solution must eventually fail to give the desired results if maintained in operation exclusively with metallic salts and insoluble anodes because only the metal is withdrawn and must be continually replaced to keep up cathode deposition.

When cadmium hydrate dissolved in sodium cyanide is constantly added to the bath such as in the solution the Udylite Company proposes, with carbon anodes, the metal is withdrawn faster than the sodium cyanide or sodium hydrate is decomposed. The results are that the solution must eventually build up with these salts so that deposition can only be carried on with difficulty and an ever increasing length of time must elapse to obtain a satisfactory thickness of deposit of metal.

To illustrate this contention under actual practice, the Udylite Process Company installed three two-hundred-gallon Udylite Process solutions in the City of R——, in Illinois. The solutions were intended for the deposition of cadmium upon steel refrigerator hinges as a basis for a rust-proof nickel deposit. There was more or less of a guarantee given that sufficient cadmium could be deposited in eight minutes on the steel hinges that would give a rust-proof coating after the cadmium deposit had been color buffed as a basis for the final nickel deposit.

The eight-minute deposit was possible the first day, the second day required twelve minutes, and more sodium cyanide and cadmium hydrate was added to replace the metal withdrawn. The fourth day required fifteen minutes and so on. The day I was present in this plant thirty minutes were required to obtain the same thickness of deposit that was possible to obtain in eight minutes the first day the solution was in operation.

If 50% cadmium anodes had been used instead of insoluble carbon anodes and 50% insoluble anodes as hard rolled nickel anodes the rate of deposition obtained the first day could have been maintained by the addition of sodium cyanide only. If hard rolled steel anodes were used instead of nickel, the sodium cyanide and sodium

hydrate would be regenerated to a certain extent and practically very little additions would be required to keep up an even rate of deposit from the solution.

Mr. Humphries is correct in the assumption that I could have elaborated quite considerably had I cared to do so in writing up my article. For his information I had reviewed Mather's and Marble's work entitled "Electro Deposition of Cadmium" in the transactions of the American Electrochemical Society, Volume 25, 1914, pages 297 to 333. If he had read Mather's and Marble's work carefully under cyanide solutions he would realize and understand that satisfactory results could be obtained from a number of cadmium cyanide solutions of varying compositions.

I again agree that my paper is not as complete from a mathematical standpoint as it might be, but I have proved what I started to prove, the comparative value of zinc and cadmium as commercial rust-proof factors for steel when based upon actual costs and results obtained at a price.

Mr. Humphries states further that "another point in favor of cadmium plating is the quicker time of plating owing to the high current density employed, etc." "This would mean increased output per unit equipment and decreased floor space. These have their values which should have been shown in Mr. Proctor's example."

The statements I have made concerning the Udylite solution in the City of R—— does not agree with Mr. Humphries' contention, that is, not with the Udylite Process, under commercial conditions.

He further states another thing. "Mr. Proctor reads from copies of the Udylite Patents that he has the fact that insoluble anodes of cadmium are used." Mr. Humphries goes on to state, "If any member will take the trouble to examine the copies of the Udylite Patents Nos. 1,383,174-5-6, he will find that in these patents no mention is made of insoluble anodes at all. In fact, it is specifically stated in each case that the anodes are metallic cadmium."

For Mr. Humphries' further information the statement I made was not in error regarding insoluble anodes, but intentional. I have gained the point I desired from Mr. Humphries. If the Udylite patents called for cadmium anodes, why were they not advocated instead of insoluble anodes? There is only one answer—financial return. The true patents so granted them for their protection are not being truly exploited with insoluble anodes, when the patents call for cadmium anodes. Some of the members of the American Electro-Platers' Society who feel that they have paid an exorbitant price for a process that is not commercially practical with insoluble anodes should make claims for reimbursement on the basis of the patents and Mr. Humphries' contention that cadmium anodes were specifically mentioned to be used with he Udylite Process and no mention made of insoluble anodes.

I am of the opinion that the deposition of cadmium can be used to an advantage when cost is not a factor when used as a commercial process, as I have outlined in my paper as originally presented. When a very thin coating of metal is desired upon steel for a protective rust-proof coating then cadmium is no doubt the metal par excellence. As a basis for electro deposits of copper, bronze and brass upon steel when a more rust-proof finished article is desired then cadmium has an advantage, but all negative metals when deposited upon cadmium have the effect of reducing the rust-proof value of cadmium as a separate factor. Especially is this noticeable in nickel plating upon cadmium plated steel. A five-minute deposit of cadmium from the solution prescribed in my paper had not broken down, that is, shown rust, under 48 hours 5% continuous salt spray test when this answer was written. A similar plated article with a half-hour nickel deposit on top of the cadmium from an efficient nickel-plating solution broke down in 15 hours under the 5% salt-spray test. A similar nickel deposit direct upon steel broke down in two hours. These figures will show to some extent the value of cadmium.

If an article, however, made from steel is plated with cadmium and is under constant friction which reduces the protecting surface very quickly, then it would be more advantageous to plate the article with zinc, because at least five times as much zinc can be deposited as compared with cadmium for the same price. Zinc is harder and resists wear better than cadmium.

The advantage gained by heating the cadmium-plated steel doubtful because it is still problematical if a cadmium steel alloy is formed upon heating the steel articles so plated to a little below the melting temperature of cadmium. There would be little advantage in commercial deposition of cadmium by such heating owing to oxidation of the surface which would nearly all have to be cut away to produce a polished surface satisfactorily for bright finishes such as nickel, etc., or similar surfaces. Platers who have had to produce bright finished deposits upon a sherardized zinc base realize the difficulty such finishes entail.

Mr. Humphries goes into considerable detail to disprove the figures of cost I have given in my cost comparisons. He must concede that the figures he gives are for ideal conditions that can never result from solutions maintained with insoluble anodes by the Udylite Process. So far as the actual value of cadmium is concerned, as compared with zinc, reports I have in my possession from the Bureau of Standards and from commercial firms who have made comparative tests, prove that cadmium still remains in the cobalt class when that metal is compared with nickel.

If the cost of cadmium was 50% below present value it might be seriously considered for special purposes under actual commercial conditions.

I would again remind Mr. Humphries, so far as his personal contentions are concerned, that facts and figures in commercial operations are based upon dollars and cents, as I outlined in my paper.

Advantages of Cadmium Plating Over Zinc Plating

C. H. HUMPHRIES

In a previous article, printed in the July issue of the Monthly Review, as also in the one contained in the present issue, the real value of the Udylite Process has been entirely obscured by the statements which have arisen as to the relative cost of cadmium plating, as applied by the Udylite Process Company, and the cost of zinc plating. The articles by Mr. Proctor have been based almost entirely upon the fact that cadmium plating costs more than zinc plating, while at the same time he has not failed to point out that cadmium plating is a better rust-proof agent than zinc. The finishes, as obtained with cadmium, are more beautiful than those obtained with zinc. They are more readily color buffed and nickeled than zinc plated articles. It is necessary to exercise only ordinary care in nickeling over the cadmium finish, while nickel plating over zinc presents many difficulties and demands special solutions. I do not know of any other rust-proof finish which can be so readily nickel plated over than the cadmium deposited by the Udylite Process.

The Udylite Process Company has never claimed, and does not claim, that cadmium is cheaper, or as cheap, as

zinc. It is understood that zinc plating is cheaper and there is no intention to compete with it in price.

Cadmium plating, as done by the Udylite Process, fills a field which zinc cannot touch. The very fact that Mr. Proctor shows by his own test that nickel over cadmium will last at least seven times as long as nickel over steel is enough to warrant the future success of the Udylite Process. Understand, these are Mr. Proctor's own figures, and naturally, are very conservative. Our own results show that we get a life of from ten to twenty-five times the best nickel obtainable.

Mr. Proctor has also pointed out that the cost of plating, when replenishing the baths with cadmium salts, is more expensive than using cadmium anodes. Obviously this is true and the Udylite Process Company realizes it. Even with this difference in cost, however, the cost of plating with a bath that is replenished with cadmium salts is still commercial.

Cadmium anodes are not used because experience has shown that an insoluble anode is better. Naturally the Udylite Process Company has protected itself in the use of both soluble and insoluble anodes, or a combination of the two. Combinations of cadmium anodes and insoluble anodes might be used in some cases, just as Mr. Proctor suggests, but the Udylite Company is better satisfied with the results obtained by Udylite where insoluble anodes only are used and an excess of the cadmium salts suspended in the solution.

Mr. Proctor further makes the statement that solutions cannot be maintained by the continual addition of Cadmium salts. This is a mistake upon Mr. Proctor's part. The Udylite Process Company has in use at the present time in their plant, and in their customers' plants, baths which have been in operation for over two years. They are working as successfully as the day they were started. It is true that the resistance of a Cadmium bath, so prepared and so maintained, will increase, but the limit of this increasing resistance is not out of a commercial range. This is owing to the fact that a fairly wide range of current density can be used, without materially changing the character of the deposit, and the conductivity of an old solution is still sufficiently great to enable it to handle the same size load when this conductivity has decreased to the minimum. Naturally the sodium hydrate contained in any bath will change in time to sodium carbonate, with a corresponding drop in conductivity. There comes a time, however, when a balance is reached and the amount of sodium hydrate contained in the bath becomes fairly constant. This balance is maintained by the continued gradual solution of the cadmium hydrate or oxide, suspended in the bath. In a solution of the type which does not contain much free sodium cyanide, cyanide additions are very infrequent and solutions have been maintained at a fairly constant metal content solely by using suspended cadmium salts in this bath, without cyanide additions for months. In solutions containing much free cyanide there will be just the same condition in regard to accumulation of carbonates as is found in cyanide plating solutions of other metals running high in free cyanide. The working value of cadmium solutions of this type, which have become rich in accumulated carbonates, has not decreased.

Mr. Proctor's statement that the Udylite Company installed three baths at a large manufacturing plant at R——, City of Illinois, is not correct. One solution only was installed, and it has worked so well that the company themselves increased their plant to three baths. This company has used the process for one year and the Udylite Process Company has on no occasion been obliged to offer them any help.

If a bath is not properly maintained and the metal content is considerably lowered it is natural to expect that with a fixed load, owing to the decrease in conductivity, that a longer time will be necessary for obtaining a given thickness of coat. The maintenance of a bath is simple and it is entirely up to the individual plater to maintain it. The Udylite Company, of course, does not control each individual solution that is in the various plants, but relies upon the plater there to maintain this as he would any other solution. Any plater is entirely competent to take charge of the bath after it is installed.

Marine Exhibit

The second annual convention and exposition of the American Marine Association was held in Grand Central Palace, November 4-11, 1922. It was a most interesting exhibit from the popular standpoint and it was also interesting from the point of view of the copper and brass consumers and manufacturers. The exposition showed very plainly how indispensable metal is in the building of ships. It is fairly safe to say that almost every machinery and equipment manufacturer present used metals in one place or another.

Exhibits of special interest in metals were as follows:

Ashton Valve Company, Boston, Mass.—Valves; whistles, etc.

Chase Metal Works, Waterbury, Conn.—Condenser tubing; naval brass; copper; rods; tubes; sheets; wire; extruded shapes, etc.

William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa.—Manganese bronze and other castings; propellers; gears; engine babbitt; white brass, etc.

Hyde Windlass Company, Bath, Maine—Bronze propellers from 8 inches to 36 inches in diameter.

International Nickel Company, New York—Nickel and Monel products.

National Meter Company, Brooklyn, N. Y.—Water and oil meters.

Scovill Manufacturing Company, Waterbury, Conn.—An extraordinary variety of products covering tubes; bars; rods; sheet, plain and fancy; wire and miscellaneous items, such as, vanity boxes, etc. One whole wall at the booth was covered with checker board of fancy sheet of varying compositions.

W. & J. Tiebout, New York—Brass locks and hardware.

Twelve-Hour Day and Seven-Day Week

I believe that generally speaking the twelve-hour day and the seven-day week should no longer be tolerated in industry, either from the viewpoint of public policy or of industrial efficiency; I believe that both have been proven to be unnecessary, uneconomic and unjustifiable.

As a matter of general policy, subject only to the demands of occasional emergency, modern industry is justified in accepting the eight-hour day and the six-day week, as a labor standard toward which all the parties interested should steadily press. Even in those industries where the continuous process is an inevitable feature, the routine should be so adjusted that the employes can have at least one day's rest in seven, and can obtain that share of leisure for self development which accompanies the work day of approximately eight hours.—JOHN D. ROCKEFELLER, JR.

Employers and Employes

A Part of the Annual Report of WILLIAM H. BARR, President of the National Founders' Association and President of the Lumen Bearing Company, Buffalo, N. Y., Presented at the Association's Twenty-sixth Annual Convention, Hotel Astor, November 22-23, 1922

THE DUTY OF EMPLOYERS

"That we may be consistent with our organization plan, our Association should be as directly concerned in analyzing and eliminating the causes leading up to strikes, and through peaceful means increasing production, as it is in correcting strikes after they occur.

"In discussions relative thereto, I frequently hear various expressions from employers concerning fundamental rights granted them under the Constitution, but which under the operation of practical politics in the United states, are very often curtailed, and, in some cases, eliminated. This is partly due to the fact that another organization with an excellent publicity staff makes a greater impression than the actual facts presented to, or the oath of office taken by, the public servant. It is not surprising, therefore, that from time to time privileges are granted to special classes, which coincidentally become a limitation of the rights of others.

"But there is no reason why a manufacturer should feel that he must subordinate himself to the demands of other groups. Neither should he regard his representative in Congress or in the State legislature as being less interested in him than of another; but the fact remains, that, due to his own inexcusable indifference to ordinary courtesy, the employer often has unnecessary penalties imposed on him.

"But although laboring under many legislative handicaps we must never forget that the manufacturer has definite duties and responsibilities—not less paramount than his rights—and must arrange his relations with his employees according to the highest standards of integrity and humanity.

"The modern employer who takes the point of view that his workers are chattels is not entitled to inclusion in an association of intelligent employers; nor has he a place in any community of good citizenship. It is true that, today, there are few unintelligent employers who seek to exploit their workers; but these should be eliminated, and thereby would be destroyed the antagonism which still exists, to some degree, in the public mind against employers generally.

"There can be no set rule for prescribing the duties of an employer, but, above all, he must recognize that the treatment of employees should inspire that desire for individual accomplishment, that pride in the job, which the labor unions have almost completely destroyed.

NO DEFINITE SOLUTION OF THE LABOR PROBLEM

"There is no definite solution of the labor problem, for human desire will always reach out for changed, if not always improved, conditions, as it is the natural desire of every man to make his path through life, and that of his family, apparently easier.

"Therefore, we should so regulate our conduct towards our workers that we will furnish an object lesson in common honesty and in good citizenship. The man who treats his workers properly will receive a fair day's work for a fair day's pay; he will be better understood as their friend, and will at once make a sharp contrast with the union labor agitator who never is a real friend of any but himself.

"An employer must not make a mental reservation that he will give only what he thinks he must, for that is merely applied dishonesty. He must understand that whatever is done for the comfort, the health, and the better living of his employees, is just as truly being done for his country and himself. The employer who is negligent in the protection of his own rights and indignant when they are violated, is usually the one who is also inattentive to his worker's just needs, but not at all dissatisfied with himself should they resent his neglect.

"The National Founders' Association is militant for the rights of employers, but it is equally insistent for the rights of those independent molders, core-makers and helpers who, after all, are the backbone of our industry. We know that, today, many members will testify to the conscientious effort of their employees, and we can in turn submit that this friendly spirit is greatly inspired by the rightful attitude of the members of this Association.

IMMIGRATION AND LABOR SHORTAGE

"I venture to predict that a period of genuine prosperity during the coming year will be limited and checked by an unskilled labor shortage, a situation which is due largely to the workings of the present immigration law. It seems to be impossible, however, to convince our lawmakers of this fact. There were certain social conditions which, two years ago, made it desirable to restrict immigration, but instead of enforcing the then existent law which amply protected us, or putting into effect a selective system effective at the point of embarkation, we adopted the present unintelligent method of a three per cent quota under which the lucky ones traveling in the first ship to arrive are sure of admission, while the competent and effective immigrant coming in a little later may be turned back."

Mr. Barr recommended that labor unions be held as responsible bodies; that they should be liable for their acts. Also that their methods and conduct should be investigated.

National Founders' Meeting

The program of the annual meeting of the National Founders' Association, held at the Hotel Astor, New York, November 22 and 23, was as follows:

Wednesday Morning Session:

Reports of President Wm. H. Barr, Commissioner A. E. McClintock and Secretary J. M. Taylor.

Report of new membership committee, H. J. Boggis, chairman.

"The Proposal to Destroy the Judicial Power," by James A. Emery, counsel National Founders' Association.

Wednesday Afternoon Session:

"The Physician in Industry," by Dr. J. J. Moorhead, New York.

"The Open Shop," by John E. Edgerton, president National Association of Manufacturers.

"The Railroad Situation," by L. F. Loree, president Delaware & Hudson Railroad.

Dinner, Wednesday Evening:

Address by Samuel Harden Church, president Carnegie Institute.

Thursday Morning Session:

"Improved Foundry Service," by D. R. Wilson, vice-president Wilson Foundry & Machine Company.

"Apprenticeship," by Wm. M. Taylor, Chandler & Taylor Company.

Reports of committees and election of officers.

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With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

SOLID AND PLATED WARE

In our August, 1922, issue we published an article by Milton S. Lissberger on Trade Brands and Practices. In this article Mr. Lissberger showed how the decision of the U. S. Supreme Court in the case of the Winsted Hosiery Company affected the entire metal trade. Stated briefly, the decision of the court was that a brand containing a quality designation must in no case be used, unless it absolutely described the contents of the material so branded.

This has long been true of silver articles. Such articles must not be stamped "sterling" unless they are truly sterling. However, the decision covering the Winsted Hosiery Company goes much further in that it covers all articles, regardless of the material of which they are made.

A question has arisen concerning the sale of copper and brass plated material as solid copper and brass. The Copper and Brass Research Association has been conducting a vigorous warfare on this form of imposition and they propose to continue to fight until they put an end to it. According to a communication from them, the decision mentioned above seems to cover their case. We are advised, however, by such an authority in its field as the Jewelers' Circular, that they know of no specific statute covering the sale of plated material as solid. This leads one to wonder whether or not the Winsted decision really covers plated brass and copper.

Undoubtedly, hardware of this sort would be covered by this decision if it were marked or stamped in any way, but it seems to us rather doubtful if misrepresentations could be prevented under the present laws unless these articles were so marked. If an article, absolutely unmarked as to content, is sold for solid brass when it is only brass plated, it would be very difficult to obtain legal recourse because of the difficulty in proving fraud.

The whole matter is one of extreme importance. There is no question of the comparative value of plated and solid ware. Each has its place and is preferable under certain circumstances, but the sale of plated ware as solid is clearly fraudulent and must be stamped out. It has resulted in harm, not only to solid ware but also to plated material since these were placed under conditions where they were never meant to be. As everyone knows a tremendous amount of plated hardware was sold as solid, especially during the war period. It is easy to understand the disgust of the buyer of such material when he discovers the deception.

Just what steps can be taken is not easy to decide. There should, however, be complete understanding between the manufacturers of plated and solid ware. Moreover, if necessary all materials should be stamped to prove their content. If existing legislation does not cover this industry, then statutes should be drawn up which will include it. The safety of both the solid and plated ware industries need this step.

SECONDARY METALS

The Annual Report on Secondary Metals, written by J. P. Dunlop, has been issued by the U. S. Geological Survey. The report of the conditions in 1921 is very interesting because among other things it explains one of the reasons for the condition of the copper market.

It seems that a large supply of scrap metal has existed in Great Britain, France and Germany. Accurate estimates of the quantity of this material were impossible to obtain, ranging from 500 million to 2 billion pounds. The continual appearance of this material on the market made it impossible for the producers of primary metal to get their old prices. Now it seems that the supplies of scrap have been greatly depleted and that there is hope for the future market. According to C. F. Kelley, president of the Anaconda Company, the scrap is almost gone and will no longer have such a depressing effect.

During the past year, however, the fact was that consumption and prices were both low. Quantities of scrap metals used were much less than in 1920 and the values were decreased in even greater ratio. Due to the fact that large consumers, like the brass rolling mills could use the high-grade scrap and surplus materials of the government without any change in the conditions of this material, they bought it direct from the government and also from foreign sources. This resulted in the elimination of a number of smaller secondary smelters. Mr. Dunlop states that the year as a whole was most unprofitable in the secondary metal trade.

During the greater part of the year there was more brass scrap on the market than the demand called for. Moreover, a part of the scrap held by the government was still unused in 1921.

On the whole, the statement is that the prospects for the small secondary smelter are not very bright because it is becoming more and more common practice for the larger plants to make alloys and secondary pig materials of guaranteed analysis. That this has had its effect on the trade is undoubted and an excellent effect it is, but whether it will eliminate the small secondary smelter is decidedly another question. To be sure, in order to guarantee analysis the material must be closely checked, but it is our opinion that the need for close checking will not eliminate the small man. It will simply force him to adopt this procedure.

It is unsafe to say that the future of this business is dark, for several reasons. In the first place, it comes fairly close to being a basic industry. Certainly no one dreams of discarding scrap metals and so long as they are saved, there will be room for secondary metal smelters. Due to the increasing intelligence of the buyers and the general belief in the standards of the trade, it will probably be necessary for the smelter man to adopt different methods of selling. Among other things eventually they will have to guarantee their product both as to metal content and impurities. However, this is something to be thankful for rather than anything else.

The price range is entirely dependent upon the prices for primary metal, but the prospects at the present time are decidedly hopeful.

SAND BLAST MACHINERY

We are advised by the W. W. Sly Manufacturing Company, of Cleveland, Ohio, of their intention to call their sand blast machinery Slyblast instead of sand blast. The reason given is that throughout industrial circles there is a growing tendency to use materials other than sand with that equipment. They mention metal shot, grit and iron crush, coke-breeze, pumice, etc. Hence the name "sand blast" no longer applies, since sand is no longer the only abrasive used. And since sand no longer applies, they suggest calling these machines Slyblast.

The W. W. Sly Manufacturing Company has our unqualified respect as a business organization. Their reputation is excellent. But as we have stated over and over again, we do not believe in adding unnecessary names to our already over-loaded trade vocabulary. We went into this matter in great detail in an editorial in our issue of May, 1922.

If the word "sand" is no longer representative of the material used in blast machinery, by all means let us change to another. There are plenty of words which can be substituted, such as for instance, "scouring" or "abrasive," or anything else. But if a name is used, it should be generically correct and all-inclusive. It should include, not only all possible materials, but all possible makes.

We realize, of course, that it is the effort of every manufacturer to make his product standard. In a very few cases, manufacturers have carried into effect their effort to make the name of their product standard, such as Kodak. But we know of no case where this has been successful where the same thing has been made by a number of different firms. In order to make a trade name standard, it is necessary to have something absolutely different from every other product; in fact, different not only in detail but in principle and in appearance. Some attempts have been made to do this by the mere force of a tremendous volume of advertising but they have failed. While the advertising was successful in bringing business to the firm, it was not successful in establishing the name of the product as a standard for the entire market.

NEW PLATINUM SUBSTITUTE

Wonders never cease, and unfortunately for our patience, the metal field is peculiarly susceptible to "wonders." We read one morning in the daily press that a new alloy had been discovered, which would take the place of platinum in everything but beauty; that this alloy was a complex combination of nine different metals, etc., etc. We got more and more discouraged as we went on until we came to the statement that it had been developed by Professor S. W. Parr of University of Illinois. Knowing that Professor Parr is a scientist of repute, we went on and almost finished the article. We were prevented from accomplishing this laudable ambition, being floored by a statement that one way in which this alloy was to take the place of platinum was in the lining of acid handling pumps and tank cars!

When we recovered our breath, we decided to find out whether the tariff or the so-called business revival was responsible for the use of platinum in tank cars. Also, we wished to find out just what had been invented, especially since the name of Professor Parr was connected with it.

Needless to say, platinum lined pumps and tank cars disappeared at our approach, but what we did discover was the development of a new alloy with acid resisting properties.

This is a substitute for platinum and gold where platinum and gold are used because of their acid resisting qualities, namely in bomb calorimeters. Moreover, it is said to be useful wherever acid is used, but about this we expect to go into much greater detail in the near future.

However, we are immensely relieved to find out that the normalcy which we are approaching has not been overthrown so suddenly. Tank cars are still cars and do not masquerade under a platinum plate. In addition we are pleasantly surprised to find that the daily press has, in spite of itself and the accompanying misinformation, really written of something in science which could be substantiated.

TECHNICAL AND SCIENTIFIC LITERATURE

Practical Spectrographic Analysis No. 444, by W. F. Meggers, C. C. Kiess and F. J. Stimson.

A brief review of various methods which have been proposed for chemical analyses by means of the spectrum is followed by a detailed description of the principle, apparatus and procedure employed in making quantitative analyses from the spectra of condensed sparks. The practical application of this method is illustrated by three examples taken from the work of spectroscopy section of the Bureau of Standards and deals with the quantitative determination of impurities in various samples of tin, gold and platinum. Other applications to problems in chemistry, metallurgy, mineralogy, physics, biology, etc., are suggested.

GOVERNMENT PUBLICATIONS

Cobalt, Malybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium and Vanadium in 1921, by Frank L. Hess, U. S. Geological Survey, Washington, D. C.

Copper in 1921 (General Report), by H. A. C. Jenison, U. S. Geological Survey, Washington, D. C.

Smelting and Refining Lead: 1921—Report made by the Bureau of Census, Department of Commerce, Washington, D. C.

Smelting and Refining Copper: 1921—Report made by the Bureau of Census, Department of Commerce, Washington, D. C.

Corrosion of Metals by Acid Mine Waters.—In the course of the general investigation of metal corrosion by mine water, being conducted by the Bureau of Mines at Pittsburgh, Pa., a study has been undertaken of the microscopy of corroded metals and alloys for the purpose of examining the preferential and differential corrosion of constituents in alloys under the action of different corroding media. The work will be done under the direction of R. J. Anderson, metallurgist, with the assistance of George M. Enos, research fellow.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

Electroplating—Its Past, Present and Future

To the Editor of THE METAL INDUSTRY:

Concerning Mr. Joseph Haas' article on Electoplating—Its Past, Present and Future.

If the Darwinian theory is true then the first monkey that slid down the trunk of a tree and stood on his hind legs was a radical. Why? Because it had never before been done in monkey-land and no doubt there was some wild chatting among the tree tops by the conservative monks who couldn't see that kind of stuff at all. No doubt, they chattered about it until they passed into the great beyond, but this younger set took a chance, and tried the stunt without ill effects and therefore continued to do so. If they hadn't, according to our friend Darwin, we wouldn't be here today. Likewise, Messrs. Proctor, Hogaboom and others are the radicals in the electroplating industry and you, rash youth, have followed their example, but you go even farther. You not only ally yourself with those chemists but you dare to criticise your elders. Judging from certain remarks, I overheard at a platers' banquet some time ago, concerning "that fellow Haas," you are in for a good panning. Perhaps you might be interested in a few remarks from another direction. Here goes!

Why pick on the assistant foremen or platers' helpers, as you call them? You speak of a class in electrochemistry which was not exactly a howling success. But how much publicity did you give it? It was never mentioned in THE METAL INDUSTRY and if your students were more inclined to swap stories than study, perhaps there's a reason. How did they get that way? Perhaps some of them work for the foremen you speak of. Get the average old-timer started on plating problems and he'll talk himself to death on the good old days when they put on a plate that you couldn't eat through with 60 emery. The assistants have heard all that bunk and seeing their bosses hold down good jobs on pure bunk, they naturally begin to think that bunk is the essential requirement of all good platers. Therefore, Joe, don't be so hard on the helpers, as their environment has a lot to do with it.

Then you speak of schools where they teach electricity and chemistry. Sure enough there are such schools but the average young man who starts in a plating room is not greatly attracted by what seems to him a dirty, sloppy job, with mighty small financial inducements. Who is apt to point out to him the way to acquire a knowledge of the art and advancement? Surely not his foreman. In nine cases out of ten if the helper gets too inquisitive about the "inside stuff" he's in line for the grand rush to the door.

Was there ever a satisfactory reason given for barring assistant foremen from some sort of membership in the A. E. S.? It was founded as a society for the advancement of the art of electroplating but you know as well as I do that a large number of your members are very backward going forward. They have hopped onto the band wagon but they don't furnish any gas to keep it going and a comparatively small percentage are doing the work. You quote THE METAL INDUSTRY editorial column. Well, if I remember correctly, one of those ediorials mentioned the fact that if the A. E. S. couldn't find some way of taking care of the young fellows, the coming generation of platers, the organization was sure to lose ground. Let me tell you, Joseph, the assistant foremen are not all dead ones, not by a tankful. I have been in the game quite a few years now and am following it along lines laid down by the regular fellows in the A. E. S. who tried, through the columns of THE METAL INDUSTRY, to point out the way to us young fellows. Thanks to their advice, not forgetting yours, which appears in print from time to time, I and a good many other assistants have seen the light and are preparing to step into the jobs which you fear will go to our friends, the chemists. I hardly think you will give much attention to an anonymous letter, but if I were to place my John Hancock at the end of this epistle and you got rash enough to turn it over to our friend, the editor, it might get into print and I would be accused of "Les Majeste" and be out of a job. Such a proceeding would greatly interfere with my plans at present, but in the near future when I step out as a foreman plater, you'll hear from me and I'll remind you of this letter. Hoping you will receive this letter in the spirit in which it is written, I remain merely,

As yet,

AN ASSISTANT FOREMAN.

Brooklyn, N. Y., November 1, 1922.

To the Editor of THE METAL INDUSTRY:

In answer to An Assistant Foreman:

Contrary to your desires, that your letter addressed to me in care of THE METAL INDUSTRY should not be published, it appears that our friend, the editor, has taken matters in his own hands, and has asked me to reply to you. So possibly you did well to withhold your name. Had the letter come directly to me, I would not have been rash as feared by you and handed it over to the editor for publication. As it is, I have had no other choice but to read your letter and to reply to it.

The reason why I picked on the assistant foremen and platers' helpers, as a class, was because my experience with them, in shops, has been as I have already stated. There is considerable truth in your contention that their environment has a lot to do with it. Bunk by so-called successful foreman platers, their fear that the helpers might learn something and many methods of discouraging the help have much to do with the attitude of helpers and foremen's assistants. It goes without a question of doubt that the old-timer in plating knows he knows nothing and therefore is afraid of his job. A plater with confidence in his ability, taking a greater interest in the affairs of his firm than merely plating their work for them, a plater that is continually on the watch to make suggestions for the good of the general organization, one that can figure labor costs and chemical costs per unit plated, need never be afraid of his job. He is a difficult man to replace. But most platers today are not such. They duck responsibility and find fault.

This is the reason why the class in electrochemistry was not given wide publicity. After three years' experience in a branch of the American Electro-Platers' Society trying to teach men the fundamental principles of chemistry and analytical chemistry applied to electro-plating, I quit in disgust. The men would not attend classes and took no interest in the class. These were men who belonged to an organization for the advancement of electroplating. They were not advancing; they were only standing still. The only benefit they got from attending a regular meeting was assistance in their immediate difficulties. They were perfectly satisfied to remain ignorant. Consequently the desire for as little of publicity as possible, to get into contact with a different class of men who might be strangers. The story was the same bunk.

Time is valuable to every man, so two experiences were sufficient. However, with still the desire to do what little can be done, to wake up an industry that has wonderful opportunities, the article "Electroplating—Its Past, Present and Future" was written. It is a pleasure to me to know that there are some like you. I hope the amount is not restricted to but a few, as I have a tendency to believe, for I have not had men in any department in my charge who felt as you do. Also, there are no helpers of mine, past or present, that can say that I have not tried to show them the way to success in the plating industry. I have practiced as I have preached.

The question of admitting assistant foremen to membership in the A. E. S. is a matter of opinion which I do not care to discuss in public. Being a society founded by foremen platers for their own benefit, they have a right to restrict their membership if they so choose to do so. And as far as the chemist taking supreme hold in the plating industry is concerned, I have no fears. I hope he does. It will give to the industry men of high calibre which it needs so much.

It will be a great pleasure to me some day to become personally acquainted with you.

JOSEPH HAAS, JR.

Muncie, Ind., November 21, 1922.

STANDARD FOUNDRY COSTS

To the Editor of THE METAL INDUSTRY:

Mr. Thomas Harper's paper, "Standard Foundry Costs," read at the October meeting of the Metropolitan Brass Founders' Association seems to be exciting interested comment. This is as it should be. There is nothing more important to an industry than its production costs.

Mr. W. L. Churchill, Industrial Engineer, takes issue with Mr. Harper. He feels that Mr. Harper's methods, if followed would effect serious harm. With this view the writer is in entire accord. The "serious harm" would result to the pocket books of the casting buyers, however, and "as it is an ill wind that blows nobody good" said harm would react to the financial benefit of we foundrymen. Mr. Churchill admits that this is a condition much to be desired.

Mr. Harper's method of forecasting prices leaves not a chance for the foundryman to lose money. If we must err, it is obvious that a mistake in our own favor is to be desired.

The writer is himself a mechanical engineer and has given much thought to the correct determination of costs from the engineer's standpoint.

The criticisms of the melting cost as determined by Mr. Harper have, in my opinion, some foundation. For a foundry turning out a uniform lot of work, be it light or heavy, the results could be relied upon as accurate. In the case of the foundry turning out a miscellaneous lot of castings of varying weights some slight errors are introduced. Such errors can be taken care of by intelligent foundrymen when called upon to estimate on any particular class of work.

That it is wrong in principle to charge a profit on the metal used is a matter of individual opinion. To the writer it seems more a case of expediency. If we can secure the order with a metal profit included, well and good. If this happy state of affairs is not possible, then it is good business to eliminate said metal profit to obtain the business. It certainly seems reasonable to assume, however, that any foundry is entitled to a metal profit equal to the interest on the investment as a minimum.

In the writer's foundry our method of pricing a casting job is to assemble together all of the items of cost entering into said job and adding thereto such a percentage of profit as it is judged will secure the work. In dull times this percentage is relatively small and during periods of brisk business it is correspondingly higher.

I hope that this important subject will be still further discussed.

WM. E. PAULSON.

Brooklyn, N. Y., November 17, 1922.

CLEANING HANDS OF LACQUER

To the Editor of THE METAL INDUSTRY:

In the November issue I notice the question, "How can I get lacquer off my hands?" and that you suggest the use of a wood alcohol.

While wood alcohol is a good solvent for so-called gums as used in lacquers, it only dissolves lacquer with acetone content, and some of these wood alcohols have only a very small amount of acetone. CP wood alcohol would not dissolve any lacquer (nitrocellulose).

But this is not the point I wish to make. Wood alcohol should not be used for washing the hands, as it is absorbed by the skin, and in this way has caused a great many diseases. You are probably aware of the fact that there are strict laws against its use in bay rum and other toilet preparations such as hair tonics, etc. Wood alcohol also takes the "life" and the oil out of the skin, and has a rather hardening action on it.

Acetone is not so bad, but being also a methyl product it is not by any means ideal as a hand wash. Neither is trichlorethane. Both are too harsh.

Most of the lacquer manufacturers have a cleaner for hands which is, or should be, put up according to the action of these different solvents on the skin. They should not contain any wood alcohol.

After using a good cleaner, the washing afterwards with tri-sodium phosphate solution is not necessary. We have customers who spray lacquer and at the end of the day there is about a 1/16 inch, or more, coating of lacquer; they have no trouble whatever to remove this with the cleaner they are getting from us, and no subsequent bad effects on the skin, in the way of chapped hands, etc.

We call your attention to this, and make the above suggestions, merely for the sake of the benefits it may bring should you care to make such correction.

Yours very truly,

Rudolph Breves,
Waukegan Chemical Company.

Waukegan, Ill., November 16, 1922.

To the Editor of THE METAL INDUSTRY:

The writer has always used wood alcohol. It is possible that a mixture of wood alcohol and acetone would be more effective.

It is presumed that lacquerers when removing the lacquer from their hands with any medium, wash them afterwards with an olive oil rubbed into the skin. This would prevent the dry condition that usually follows as the correspondent infers, or glycerine may be used.

If the Waukegan Chemical Company has a cleaner that will do its work thoroughly and not leave any of the bad effects they have outlined, why not advertise it in THE METAL INDUSTRY? CHARLES H. PROCTOR.

New York, November 25, 1922.

COLORING PROBLEM SOLVED

To the Editor of THE METAL INDUSTRY:

I beg to thank you for the information about coloring copper which your expert furnished and which I believe is just what I require. I have always found your valued journal of interest, but this is the first time I have found it necessary to write to you for information, and I am well pleased with the result.

CHARLES H. MARSLAND.

Rome, N. Y., November 1, 1922.

NEW BOOKS

Welding Encyclopedia, 2nd edition, published by the Welding Engineer Publishing Company, Chicago, Ill. Size 6 x 9, 314 pages. Price, payable in advance, $5.00. For sale by THE METAL INDUSTRY.

This is the second edition of this book. It contains 50 per cent more text material than the first edition and these additions are almost all along practical welding lines. The first part of the book is the encyclopedia proper, namely, definitions of all the words and trade terms used in welding processes. Following this section are chapters written on the four types of autogenous welding, namely, electric arc, resistance, spot and oxy-acetylene welding. Under oxy-acetylene are included methods of welding non-ferrous metals and alloys, such as aluminum, copper, brass and bronze.

This is followed by methods of welding specific pieces, such as boilers, pipes, tanks and rail joints. Additional data are given to aid the welder in a general way. A. S. M. E. boiler code and other rules are given. Numerous charts and tables are included. The volume is profusely illustrated with sketches and photographs. The book should be in the hands of everyone interested in welding.

Chemical Engineering Catalogue, 7th annual edition. Size 9 x 12, 1,183 pages.

This catalogue is stated to be the collected and standardized data of equipment, machinery, laboratory supplies, heavy and fine chemicals and raw materials used in the industries employing chemical processes of manufacture. There is included a general directory of such equipment and materials and a technical and scientific book section. The scheme followed out is to describe the products of each company which takes space in this volume and illustrate them. For the manufacturer or user of metals, much will be found of interest in this volume along the lines of equipment, machinery, etc. The catalogue is leased for the period of one year at $2.00 a copy to those who come under certain professions. To all others, the price is $10.00.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

BRASS SOLUTION

Q.—My brass solution does not hold its color on exposure to the air. It turns red and spots. What is wrong?

A.—We should infer that your brass solution contains too much zinc and is also deficient in free cyanide.

Add at least 1 oz. of bisulphite of soda per gallon to bring up the copper, then add an equal amount of sodium cyanide. Work the solution with the anodes using a good strong current. The brass color should become normal by adding a small amount of aqua ammonia, ¼ ounce per gallon unless the zinc in the solution is in excess. In such an event at least one ounce of sodium and copper cyanide will be required per gallon to overcome the excess of zinc.

Brass solutions require considerable attention. Anodes should always be removed when the solution is not in use to avoid deterioration of the cyanide, by local action upon the anodes.

Salt air has nothing to do with the condition or results of the brass solution that you now operate. To overcome spotting-out wash the articles thoroughly in cold and boiling water. Add 1/16 ounce phosphoric or muriatic acid to the boiling water to neutralize the brass solution in the pin holes in the brass-plated metal and afterwards. Dry out thoroughly by heat.

For a brass solution first prepare a copper solution as follows:

Water	1 gallon	(Use 1/3 hot water
Sodium Cyanide	5 ozs.	first).
Copper Cyanide	4 "	
Bisulphite of Soda	1 oz.	
Caustic Soda	½ "	

Dissolve the sodium cyanide and copper cyanide in the ⅓ hot water, then add the balance cold, then add the soda salts in the order given. Set up and run for a time. A good copper deposit will result.

For every gallon of copper solution dissolve 1½ ounces sodium cyanide and 2 ounces zinc cyanide in as little hot water as possible for solution. Then add to the copper solution a little at a time. Add half first, then ¼ to ½ ounce aqua ammonia to bring up the yellow brass deposit.

The copper solution should be at a normal temperature, when the zinc solution is added.

It may not be necessary to add the entire amount of zinc to the copper solution at first, but later it will be required. So use care at first in its addition or for a time your brass color may have a zinc tone. An excellent brass solution may be prepared as outlined.—C. H. P. Problem 3,074.

CLEANING JAPANNED ARTICLES

Q.—The writer in visiting, recently, the Japan Room of a large concern found that their method of cleaning was as follows:

First—Stripping tank, taking off all old Japan.
Second—Acid dip.
Third—Cold water.
Fourth—Hot potash.
Fifth—Hot water.

When the writer asked why they used cold water after the acid dip, the only answer was that they had always used cold water.

Will you kindly advise whether hot water would not be far better, inasmuch as the action of the acid on the metal tends to generate heat—hot water would wash off traces of acid more easily than cold water—and then the metal being hot, the hot caustic tank would keep more nearly the proper temperature?

A.—Many firms still adhere to methods outlined in your question for the very reason that the cold water, if a running cold water, is constantly replaced and the acid remaining upon the steel is thus diluted accordingly, and there is less danger of carrying acid into the hot potash, which would have a neutralizing action.

Hot water has always a more diluting action than cold, because its action is more rapid. We know that substances that dissolve in cold water are many times more soluble in hot water. Therefore, your contention is correct. Hot water is more effective, providing as outlined it is sufficiently diluted by running water to keep the acidity down to the zero point, which would then have no action upon the alkaline cleaning solution.—C. H. P. Problem 3,075.

COPPER ON PLASTER

Q.—We are coppering plaster cast book-ends, and run them for 24 hours. It takes 5 to 8 hours before they cover over. The solution we are using stands 19° Baumé; the deposit is very thin and covered with warts. Please let us know what we can do to overcome this.

A.—Your copper sulphate solution used in depositing copper upon plaster casts (book-ends, etc.), should be agitated with air to give the best results. Or the cast may be moved up and down in the solution with a vertical motion which will give similar results to air agitation.

The sample of copper deposit submitted appears ductile and malleable indicating that the sulphuric acid and sulphate of copper is fairly well-proportioned.

We would suggest that you add 2 ozs. of sulphate of aluminum per gallon of solution to overcome the streaks.

If the deposit then continues slow under agitation as outlined add 1 ounce or more of sulphuric acid per gallon. Be very careful to see that the acid is thoroughly mixed with the solution. Better start with half an ounce per gallon and add at the close of the day's work.

If the deposit becomes dull then a little molasses may be added as a brightener, ⅛ ounce per gallon will be ample.

Possibly under conditions outlined you can use a higher voltage with resulting increase in amperage.

You should obtain all the copper required in 12 hours.

Keep copper sulphate suspended in bags in the solution to keep up a uniform strength after you have got the solution in good working condition.—C. H. P. Problem 3,076.

GREEN GOLD

Q.—Kindly advise us of the best stripping solution for gold from 10 to 18 karat.

A.—The following formula has been published several times in THE METAL INDUSTRY for removing the green from gold. It has always given the desired results but the articles must be thoroughly moved to and fro while in solution. Otherwise the gold surface will be matted instead of a clean bright color.

Water	1 gallon
Sodium Cyanide	6 ozs.
Copper Cyanide 1½ ozs. or Copper Carbonate	2 ozs.
Carbonate of Soda Crystals	4 ozs.
Aqua Ammonia, 26%	4 "

Use the solution at 120 deg. Fahr. The articles become the anodes (positive current), the negative or cathodes should be sheet copper and should entirely surround the articles to be stripped. Use from 3 to 4 volts.

Be sure to keep the articles in agitation during the stripping.—C. H. P. Problem 3,077.

MERCURY STAINS

Q.—Kindly let us know what causes mercury stains on work in process and how to overcome them.

A.—Your inquiry is somewhat vague regarding the mercury streaks you complain of. The question arises—what are

your methods and manipulations that produce the stains you complain of?

So far as we are able to answer, we are of the opinion that if you are using the mercury dip in connection with your silver plating, then the solution may be too strong.

If dark bluish black stains develop in the mercury deposit as it comes from the mercury dip, and are not removed in washing in water, then prepare a strong sodium solution 96-98% on the basis of: Water, 1 gal., sodium cyanide, 6 to 8 ozs.

Immerse the articles that show stains after washing in this cyanide dip. It will remove them. The articles should then be rewashed in water and silver plated as usual.

If these suggestions do not answer your question, then give us more details and we shall try again.—C. H. P., Problem 3,078.

NICKEL SOLUTION

Q.—I am running four 200 gallon nickel plating tanks. One of them is acting in manner described below and although I get a good deposit, this particular tank still deposits darker than the other three, although after coloring it looks the same as the other three. The solution is composed of single nickel salts 20 ozs. per gallon; boric acid 2 ozs.; sal ammoniac 1 to 2 ozs.; epsom salts 2 ozs. I have added 10 new 24" anodes (cast) and I also added ¼ oz. sulphuric acid per gallon; on agitating the solution it deposited a little better color. I run all the tanks hot, at a temperature of 120°-125 degrees and keep them up to read 15° Baumé. I have tried to standardize my loads and solutions, and have had remarkable results until just lately. My only trouble was the offending tank mentioned above.

A.—It is difficult to determine at a distance just why this particular nickel solution does not give just as good results as the other three 200 gallon nickel solutions run under identical conditions as to composition of formula, temperature and current conditions.

It is possible that the surface of the new nickel anodes recently installed in the solution is hard to reduce, especially if the anodes are cast in iron moulds. If you have a sand blast you might sand blast the surface of the anodes. If not, make up a nitric acid dip, 50 acid and 50 water. Make a warm solution. Immerse the anodes in the dip for a time to dissolve the hard outer skin.

Afterwards wash the anodes thoroughly to remove all traces of the nitric acid, and note results. It may be possible that more acid may be required in the solution afterwards to bring up a white color. Try hydrochloric acid instead of sulphuric acid. Make the additions up a ⅛ oz. per gallon basis and repeat.

If the color is still dull and of a dark tone, a colloid may be of value. Add then ¼ ounce of gum arabic dissolved in hot water to the entire solution. This amount may be repeated, but at an interval of eight hours. See that the gum thoroughly permeates the solution.—C. H. P. Problem 3,079.

OLD ROSE GOLD

Q.—How can I make an old rose gold finish?

A.—The following formula may be used for an old rose gold finish:

Water	1 gallon
Potassium Ferro-cyanide	2 ozs.
Carbonate of Soda Crystals	2 ozs.
Gold Chloride	⅓ oz.
Sodium Cyanide, 96-98%	⅛ oz.

Temperature of solution: 160-180° F. at 6 volts. Plate for a few moments then remove and relieve high lights with bicarbonate of soda. Rewash in water and replate for a moment or two at 2½ to 3 volts so that a good yellow results upon the high lights with an old rose in the background.—C. H. P. Problem 3,080.

PEELING NICKEL DEPOSIT

Q.—We are having considerable trouble with silver on articles which are brass connected to white metal. The articles mentioned are dragon heads on a soda-fountain, the long neck seems to be brass and the head seems to be white metal. We have tried the blue dip, and all our silver strikes and still it does not work, it will insist on peeling off. We have both nickel and copper struck these articles mentioned in this letter and with the same results. No good.

A.—It is our opinion that your entire trouble develops from your cleaning operations. Strong cleaning solutions possibly reduce some of the white metal and soft solder and redeposit it upon the brass to which no deposit will positively adhere.

Prepare a solution as follows:

Water	1 gallon
Trisodium Phosphate	4 ounces
Soda Ash 58%	4 ounces
Sodium Cyanide	¼ ounce

Immerse the articles in this cleaner for a moment or two, then brush them over with carbonate of lime, mixed with water and use a little cyanide, then nickel plate them direct. From the nickel solution wash them, then silver strike in the usual silver strike solutions and then silver plate them in the regular manner.

You can use the copper strike if necessary before nickel plating, but it may not be necessary.

The point is to determine whether your cleansing is the source of your trouble. A good nickel solution for such combination metals—brass and white metal—is as follows:

Water	1	gallon
Single Nickel Salts	8	ounces
Double Nickel Salts	2	ounces
Boracic Acid	3	ounces
Sal Ammoniac	1½	ounce
Pure hydrochloric acid	¼	ounce

Voltage 3 to 4.

C. H. P. Problem 3,081.

SILVER ON CELLULOID AND WOOD

Q.—How can I deposit silver on celluloid or wooden umbrella handles?

A.—An interesting article entitled "Silver Ornamentation of Fountain Pens," by Mr. George B. Hogaboom would prove instructive and interesting to you as it covers silver deposition similar to that upon celluloid or wood umbrella handles. The article was printed in THE METAL INDUSTRY in July, 1909, pages 241 and 242.

Mr. Hogaboom gives as the size French Copal Gum dissolved in benzole to form a fairly saturated solution that must be free from dirt or sediment. The solution so prepared should be filtered through several thicknesses of cheese cloth.

The solution or varnish should be diluted so that it will flow freely and yet leave a good tacky body that will hold and support pure platers' copper bronze powder, that should be mixed and applied with the varnish as the metal basis for the silver deposit. When the copper varnish deposit is thoroughly dry after applying and before silver plating the copper bronze surface so applied upon the wood or celluloid handles they should be immersed in a mercury quicking dip composed as follows:

Water	1 gallon
Sodium Cyanide 96.98%	4 ounces
Yellow Oxide of Mercury	¼ ounce

After immersing in the mercury dip the handles should be properly wired with thin soft copper wire in direct contact with the copper bronze surface. After washing in water the handles are ready for silver plating. A concentrated silver solution should be used. The following formula should give a satisfactory heavy deposit of silver at 1 volt. Amperage must be governed according to the surface area to be silver-plated:

Water	1	gallon
Sodium Cyanide	6½	ounces
Silver Cyanide	6	"
Potassium Carbonate	1½	"

Dissolve the sodium cyanide first in one-third the total amount of water to be used for solution at a temperature of 160 deg. Fahr. Then add the silver cyanide. When dissolved add the balance of the water cold. Finally add the potassium carbonate. The silver anodes should not exceed the surface area upon the handles to be plated.

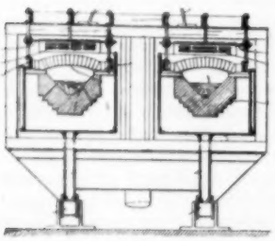
Some firms use a very fine silver powder instead of copper bronze as the metal factor. Other solvents could be used such as acetone or trichlorethane.—C. H. P. Problem 3,082.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

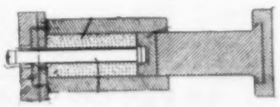
1,420,687. June 27, 1922. **Electric Furnace.** Samuel N. Castle, New Rochelle, N. Y.

A large surface of bath is desirable for refining purposes and also it is desirable that the greatest heat shall be generated at the surface. Accordingly bearing in mind that there is a large leakage flux adjacent the windings and outside the core in apparatus of this character, make the walls of the crucible sloping so as to give an increased surface of bath and the inducing windings are placed above the bath so that the surface, being the nearest to the windings, has the greatest heat developed in it.



1,423,361. July 18, 1922. **Device for Producing Extruded Sheet Metal.** Albert F. Rockwell, Bristol, Conn., assigner to Marlin-Rockwell Corp., N. Y., a corporation of New York.

This invention relates generally to apparatus for reducing metal ingots to sheet form. It has been discovered that several steps can be dispensed with in the ordinary process of reducing the ingot to sheet form, thus reducing quite materially the cost of production, and in addition produce a sheet metal having greatly improved characteristics with relation to the quality of the metal in the final product.



1,424,483. August 1, 1922. **Drilling Machine for Tapping Out the Hot Metal of Furnaces and Cupolas.** Joseph E. Judy, McKeesport, Pa.

The invention contemplates the provision of a drilling machine adapted to be operated by fluid pressure and to be suspended from a jib crane or other movable supporting element and swung into position in front of the tapping hole and held there during the drilling of the hole.

1,424,595. August 1, 1922. **Casting Machine.** Paul E. Schwarz and Thomas D. Salmon, Philadelphia, Pa.

This invention relates to devices particularly designed for making dental and similar castings, and one object of said invention is to provide a simple, reliable, comparatively inexpensive device for causing air pressure to be applied to a body of molten metal, with a view to causing this to flow into a suitably positioned mold.

1,424,171. August 1, 1922. **Machine for Manufacturing Tubing.** Dwight B. Lee, Detroit, Mich., assignor to Motor Products Corp., Detroit, Mich., a corporation of Mich.

The invention relates to the manufacture of metallic tubing of that type in which the tube is first formed up from sheet metal with a locked seam, the seam being soldered to effectually seal the same.

1,425,111. August 8, 1922. **Alloy for Use in Electric Heating Appliances.** Geo. Harry Lofts, Hobart, Tasmania, Australia.

This invention relates to the manufacture of an alloy that was found especially useful in electric heating appliances for the protection of same. In such appliances a fusible metal has been employed to cut off the power or current in order, for instance, to avoid over-heating.

1,425,046. August 8, 1922. **Liquid Polish for Metallic and Other Surfaces.** James A. Palmer, Jamaica Plain, Mass.

The invention has for its object among other things, to provide a polish for metallic surfaces; a polish that shall be easily and quickly applied; a polish having a substantial and elastic body thereby assuring proper "filling" and uniformity of application in creating an even, smooth and glossy surface; a polish that shall be non-inflammable and yet shall evaporate sufficiently rapidly to enable it to be used on cold surfaces, and yet shall not evaporate so rapidly as to leave hardened brushmarks or a streaky or uneven surface after the polishing operation.

1,425,184. August 8, 1922. **Production of Thin Metal Sheets or Foils.** Thos. A. Edison, Llewellyn Park, West Orange, N. J.

One of the objects of this invention resides in an improved process and improved means whereby thin sheets or foils of metal, preferably nickel, of any desired length may be electrolytically produced more effectively and economically, and preferably by operations which may be carried on continuously.

1,425,330. August 8, 1922. **Alloy.** Svend M. Meyer and Wm. James, Brooklyn, N. Y., assignors to Magno Storage Battery Corp., New York, a corporation of Delaware.

The alloy comprises, as essential ingredients, tin, antimony, lead and zinc. The proportions of these essential ingredients may be varied somewhat to satisfy particular requirements but the composition which we have found especially suitable for many purposes contains in the neighborhood of 50% ton, 25% lead, 17% zinc and 8% antimony.

1,425,612. August 15, 1922. **Method of Producing and Applying Enamel Coatings to Metallic Surfaces.** Herbert M. Smith, Great Barrington, Mass., assignor to Stanley Insulating Co., Great Barrington, Mass., a corporation of Maine.

This invention relates to a method of producing and applying a vitreous enamel for insulated containers and receptacles and that will stand mechanical shock, rapid thermal changes and deflection. With this object in view a new combination of materials has been devised and a novel and effective way of preparing the metallic surface to which it is to be applied. Provision has been made for the removal, as rapidly as they are formed, of the gases which are formed during the fusion of the enamel.

1,425,661. August 15, 1922. **Process of Manufacturing Zinc Dust.** Teisuke Kato, Hyogo Ken, Japan.

This invention relates to a process of manufacturing zinc dust consisting in converting metallic zinc or ores or other materials containing metallic zinc or zinc oxide, into zinc vapor by heating the material together with a reducing agent by fuel or electricity in a furnace or retort so constructed that it is not exposed to the atmospheric air.

1,425,572. August 15, 1922. **Zirconium Alloy and Process of Making Same.** Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., Niagara Falls, N. Y., a corporation of W. Va.

This invention relates to a novel alloy consisting essentially of zirconium, silicon and iron, and to a process of making the same.

1,426,141. August 15, 1922. **Process and Apparatus for Electroplating.** William E. Belke, Chicago, Ill.

The object of the invention is to provide an improved construction and an improved method or process whereby the electroplating solution is drawn from the tank, and is then filtered and returned to the tank.

1,425,851. August 15, 1922. **Metal-Treating Apparatus.** John F. Gillan, Schenectady, N. Y., assignor to General Electric Co., a corporation of New York.

The invention comprises an improved apparatus for carrying out metal coating processes, and particularly the process known as sherardizing, which involves the surface alloyage of a metal with zinc.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

BARREL SAND BLAST

The utility of the barrel sand-blast for cleaning work adaptable to this method of handling and its economy through the work being cleaned in bulk makes improvements in this character of equipment of interest to the majority of sand-blast users.

A new barrel just introduced by the Pangborn Corporation of Hagerstown, Md., is said to embody features that have taken into consideration economy of operating cost, from the viewpoint of both increased efficiency of blasting action and durability of the equipment itself.

Experience has shown that cleaning capacity in sand-blasting is governed by the distance of the nozzle from, and its angle to, the work. To accommodate varying classes of work with the changing sizes of the individual pieces and the corresponding "ride" within the barrel drum, the nozzles are made adjustable in both horizontal and vertical positions to secure the most effective position.

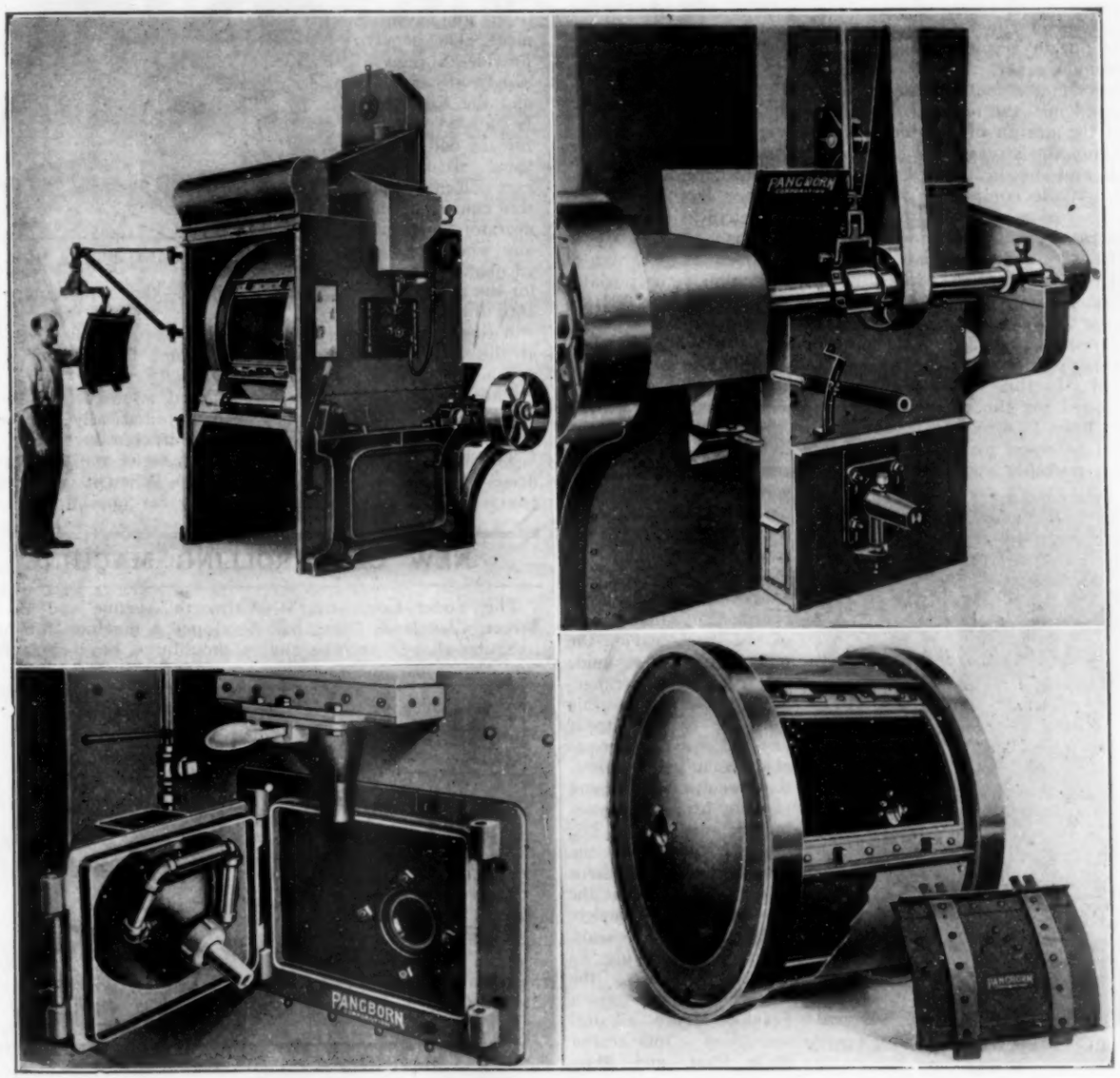
A mechanical separator for the separation of the abrasive for reuse is obtained by a ribbed roller driving against a shaft protected by heavy rubber tubing. This tubing takes the entire wear and is quickly and cheaply replaced.

Long life for the equipment is provided in every moving member. The barrel drum is reinforced at door opening with plates and angles inside and outside; steel tires pinned to head castings and driving on manganese steel rollers, with front rollers idle and equipped with roller bearings, provide smooth even traction with little wear.

Driving sprockets are steel and with chain run in oil bath, all encased dust tight. The clutch is simple and positive acting. Two sizes with drums 30 x 40 and 50 x 40 make it available for work of a wide variety in size.

REFINED GRANULATED NICKEL SALTS

To avoid the delays and inconvenience incident to the dissolving of nickel salts in the large crystal form when making



FOUR VIEWS OF THE PANGBORN SAND BLAST BARREL

up new or replenishing old nickel solutions, the Hanson & Van Winkle Company, New York, announces that it has developed and offers for sale refined granulated double nickel salts and refined granulated single nickel salts.

These salts are guaranteed by the manufacturers to be purer and to have a higher nickel content than any nickel salts now on the market. Their use, it is claimed, will save the plater time, annoyance and a mussy job. The use of a small jar and steam hose, required when making solutions from large crystal salts is eliminated.

To make a solution from granulated salts use water of normal temperature and slowly pour the granulated salts into the water, while stirring. The salts will dissolve almost instantly. Old solutions can be replenished by simply adding the granulated salts while stirring.

MOTOR DRIVEN CHAIN HOIST

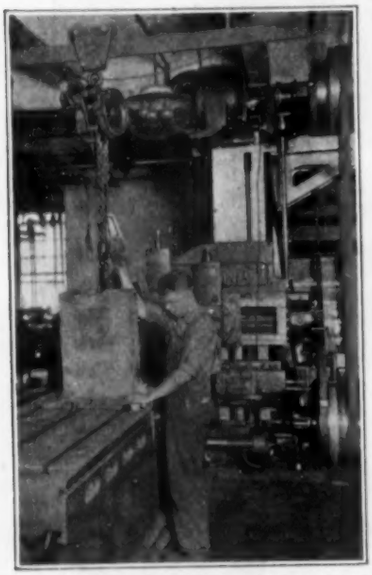
An electrically operated material-handling device, known as the Motorbloc, has been placed on the market by the Motorbloc Corporation of Summerdale, Philadelphia, Pa.

This new device has been developed to serve the operations lying between the well-defined field of the standard hand chain hoist and that of the traveling electric hoist, with the substantial overhead and electrical installation which its heavy duty requires.

The Motorbloc is, it is claimed, a rugged, and readily portable hoist, which can be installed without engineering preliminaries in any location where electric current is available. It is put in service with the facility of an electric drill or vacuum cleaner, and the self-contained pendant controller permits convenient operation as soon as the cord has been plugged into the nearest electric circuit.

In the design of the motorbloc, great care has been used to avoid the stressing of the hoisting mechanism beyond the loads and speeds for which it is proportioned for hand operation. While completely removing the labor from the hoisting operation, it is stated, that the electrification **actually reduces** the wear on some of the vital parts.

The Motorbloc consists of a standardized chain hoist of steel construction, electrified by the application of a specially designed heavy-duty motor, liberally proportioned reduction gearing and slip friction clutch, applied by means of a malleable iron supporting bracket comprising a self-contained electrifying unit, to which the pendant controller is also attached. In this way a simple, rugged mechanism has been developed for the electrification of the standard spur-geared chain hoist in capacities ranging from ¼ to 10 tons, proportioned to stand up under the severe overloads and abuse to which portable apparatus of this character is subjected by common labor, generally unfamiliar with the handling of power machinery.



MOTORBLOC—A MOTOR DRIVEN CHAIN HOIST

The self-contained pendant controller is easily operated by the fingers of one hand, leaving the other hand free to guide the load. This arrangement makes it possible for one man, without physical effort, to accomplish what would otherwise require two or more men for lifting and placing the same load. The ready portability of the Motorbloc is apparent from the fact that the one-ton size complete weighs only 148 pounds.

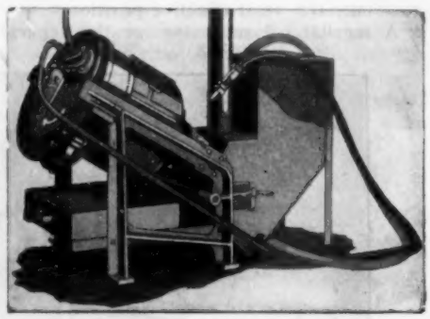
The accompanying illustration shows the Motorbloc built on a Franklin-Moore all-steel suspension spur-geared chain hoist, and illustrates the facility with which one of these electric blocks can be hooked up.

For occasional use at points where electric current is not available, or in the event of the temporary failure of electric power, the hand chain can be quickly applied, and the hoist operated as an ordinary block. While regularly furnished as a complete hoisting device, the self-contained electrifying unit can be readily applied to standard chain hoists already in service.

TILTED SAND BLAST MILL

Of the five different sized tilted sandblast mills manufactured by The W. W. Sly Manufacturing Company, Cleveland, Ohio, the number four which has a barrel 20″ in diameter by 20″ deep, has for a number of years been the favorite. It is said to be extensively used in the small brass shop. Also, it has found universal endorsement in those plants manufacturing small hardware, stampings and forgings.

In a small shop where such a mill represents the only sandblast equipment it was found that occasionally there were pieces it was desired to blast but which were too large for a mill. To care for this condition an additional feature was added to the mill consisting of an auxiliary sand hopper with a hand gun attachment. The hopper provides a reserve supply of abrasive and the hand gun is always ready for any odd or unusual sized castings. Hence with this equipment the operator can clean any work he may encounter, caring for the regular production in the mill and the extraordinary work with the hand gun.



SLY TILTED SAND BLAST MILL

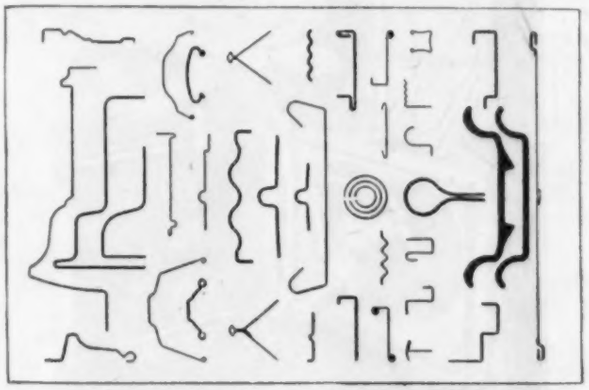
A tilted mill equipped as above described was first exhibited at the 1922 Foundrymen's Convention. Since then a large number is said to have been purchased.

The consumption of air, it is claimed, is small; the abrasive is used over and over again, being automatically returned to the gun, while the dust is carried off by fan suction.

The mill is shipped all set up with tight and loose pulley drive. It requires 4′ x 5′ floor space. When it is belted and compressed air connected it is ready for operation.

NEW COLD ROLLING MACHINE

The Yoder Company, at Walworth Avenue and W. 58th Street, Cleveland, Ohio, has developed a machine for rolling irregular shapes, such as angles, mouldings, beadings, tubings,



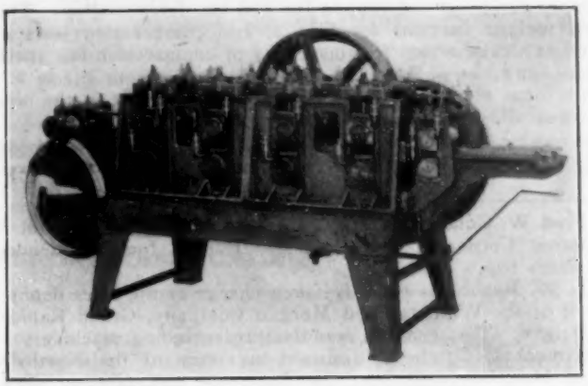
SHAPES MADE ON THE YODER MACHINE.

automobile rims, hoops for steel drums, roofing sheets, portable garage siding, car roofing, fireproof building material, such as channel, corner beads, window jambs, pulley stiles, shutter slats, etc., which, it is claimed, largely supersedes the drawbench, press or brake, heretofore used for these purposes, and so largely increases the production as to greatly reduce the cost of manufacture.

The machine consists of a cast bed or frame surmounted by removable housings, holding the spindles and rolls. The machines are built in units of from two to eighteen pairs of rolls, depending on type and size of section to be rolled; the rolls are geared direct from main drive, and in case ten or more pairs of rolls are used, two driving units are synchronized to drive all the rolls at a uniform speed.

The Yoder machines have, it is claimed, a distinct advantage over other methods of producing irregular sections. The material passes through the machine continuously; the flat stock being fed into the machine, comes out a complete and finished product, with no loss of time or waste of material, as is the case with the drawbench. Then, too, sections of indefinite lengths and widths can be produced, which is a distinct advantage over the press, drawbench or brake.

The illustration shows one of the four roll machines equipped for rolling and coiling in one operation, hoops for steel containers. These hoops are formed and coiled from the flat strips in one operation, at the rate of 8 per minute. Automobile rims can be formed and coiled at the same rate, and sections of various kinds can be run at the rate of 60 feet to 120 feet per minute, depending on shape of section and thickness of material used. The machine works equally well on steel, galvanized or black iron, brass, copper or aluminum.



YODER COLD ROLLING MACHINE

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 South Dearborn Street, Chicago, Ill.

The 1923 meeting of the American Foundrymen's Association will be held in Cleveland, Ohio, during the latter part of April.

The convention will begin on April 28, 1923, with exhibits. Meetings will begin April 30. Both will continue until May 3, 1923.

An invitation from the Association Technique de Fonderies de France to participate in an exhibit in Paris in September, 1923, was accepted and referred to a committee for action.

AMERICAN ELECTROPLATERS SOCIETY

BRIDGEPORT BRANCH.
Headquarters, care F. J. Spaine, 1323 N. Avenue.

The Bridgeport Branch will hold its regular meetings on the first and third Fridays of each month. The meeting on the third Friday will be an open meeting. The speakers' committee has arranged to have various talks on these nights, and an invitation is extended to all manufacturers, superintendents, platers and assistant platers to attend. Meetings will be held at 258 John street.

PHILADELPHIA BRANCH
Headquarters care P. Uhl, 2432 N. 29th Street

The Philadelphia Branch held its eight annual banquet on Saturday, November 25, 1922, at Mosebach's Hall. Over 100 guests were present.

During the afternoon session papers were read and discussed. They centered largely on typical plating-shop troubles. A number of interesting finishes were shown. In the evening the banquet was held. Souvenirs were distributed by various supply houses. There was music and dancing, and everyone enjoyed a thoroughly good time.

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University, New York, N. Y.

At the meeting of the New York Section of the American Electrochemical Society, at the Chemists' Club, last night, November 17, Dr. E. P. Mathewson gave a very fascinating illustrated talk on mining and living conditions in Burma, as he encountered them during his recent visit there. Dr. Mathewson outlined briefly the various metallurgical steps involved in the treatment of complex sulfide ores. These sulfide ores contained not only silver and lead, but also zinc and copper.

C. H. Davis, of the American Brass Company, described his improved method of spectrum analysis. Traces of impurities in copper, brass, zinc and German silver can be detected in very short order, using a few milligrams of the material.*

At the conclusion of the technical program, election of officers of the Section took place. Dr. H. C. Cooper, 38 Clinton street, White Plains, N. Y., was elected chairman; Dr. James Kendall, of Columbia University, vice-chairman; Mr. Paul DeV. Manning, of 2 Rector street, New York City, as secretary.

The next meeting of the Section will be held on the evening of February 9, at the Chemists' Club.

*Mr. Davis read a paper on the subject of spectrum analysis at the New York meeting of the Institute of Metals Division, February 20, 1922. An abstract appeared in METAL INDUSTRY for March, 1922, page 94.

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

At a recent meeting of the Executive Committee the following were re-appointed as representatives of the Society on the Committee on Non-Ferrous Alloys Advisory to the U. S. Bureau of Standards: W. H. Bassett, William Campbell, G. H. Clamer, N. K. B. Patch and W. R. Webster. The committee met in Washington on October 31.

The A. S. T. M. and the American Foundrymen's Association have reached an agreement on details of co-operation between the two societies. The A. F. A. will be represented on various committees. L. W. Mueller will serve on B-2, Non-Ferrous Metals and Alloys.

Committee B-2 on Non-Ferrous Metals and Alloys held a meeting at the Society's Headquarters on October 26. The committee is giving further consideration to the tentative specifications submitted at the recent annual meeting, particularly the Specifications for Admiralty Condenser Tubes. The appointment of a Sub-Committee on Lead Pipe and also a Sub-Committee on Metallic Fluxes and Deoxidizers was approved.

Sub-Committee II was asked to consider the desirability of drawing up specifications for hard-rolled copper rods for cold drawing.

Sub-Committee III will be engaged during the coming year in a series of co-operative tests leading to specifications for

proper design of test coupon for cast non-ferrous alloys. This will include coupons for tension and compression tests as well as a comparison for the results of compression test specimens for ratios of length to diameter varying from 2: 1 to 4: 1 with those of the test specimens at present in use in the non-ferrous alloy specifications.

Sub-Committee VIII will co-operate with Sub-Committee III in this series of tests. Mr. E. H. Dix has made some tests of the conductivity of silicon-aluminum alloys and the committee will undertake some co-operative tests on sand-cast aluminum-silicon, aluminum-silicon-copper and also duralumin alloys.

Personals

Fred W. Cohen, assistant general manager of the Metal & Thermit Corporation, has gone to Europe for an extended business trip.

L. W. Byrne has recently taken charge of the sales department of the Wilmarth and Morgan Company, Grand Rapids, Michigan. This concern manufactures grinding machinery.

Samuel McCutcheon, assistant secretary of the North & Judd Manufacturing Company, hardware manufacturer, New Britain, Conn., was elected treasurer of the company.

A. M. Erichsen, director for A. L. Norsk Metalverk, Porsgrund, Norway, is in the United States, for about a month, on business. He is investigating electric furnaces for copper and brass.

W. W. Sayers, of the Link-Belt Company, has been promoted to the position of chief engineer of the company's Philadelphia works and Eastern operations. His headquarters will be at the Philadelphia office for the future.

George Macnoe, Manager of the Boston office of W. B. Conner, Inc., N. Y., has been re-called to New York to take charge of the Contractors Sales Dept., handling heating and pumping equipment.

Arthur Rosenhain of England will deliver the second annual lecture before the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers on February 19, 1923. His subject will be "Solid Solutions."

Geo. G. Knecht, who is very well known in the trade, has joined the sales force of the Hanson & Van Winkle Company, with headquarters in Rochester, N. Y. Mr. Knecht was for many years sales representative for Walter C. Gold of Philadelphia.

George E. Savage, president of Manning, Bowman & Co., making nickel-plated wares, will take a hand in the management of Foster, Merriman & Co., manufacturers of cabinet hardware and auto accessories and brass and iron founders, which has been reorganized.

F. N. Pickett, the English engineer who organized the operations in reclaiming scrap metal from the munition dumps and battlefields in France and Belgium, proposes to turn to account the organization he brought into existence for that purpose by establishing in his own country a great zinc industry. He has perfected an improved electrolytic process and feels convinced that if the Government will but give him assistance he can set up industrial plants which will give employment within very few months to from 40,000 to 50,000 workmen and free Great Britain from dependence upon any other country for zinc.—H.

Fred J. Liscomb, for many years in the research department of the Hanson & Van Winkle Company, will be in charge of their engineering and chemical departments and may be consulted on electroplating and kindred problems.

FRED J. LISCOMB

Edward L. Gann, who for a number of years has been employed in the electro-plating demonstrating department of the Hanson & Van Winkle Company, Newark, N. J., has been appointed by that company as a special outside demonstrator, his duties now being to demonstrate the new Roylite metal cleaner manufactured by the Hanson & Van Winkle Company.

The Hanson & Van Winkle Company announces that **Burton G. Daw** has recently been appointed district manager of their Cleveland branch, located at 1434 West Third street, Cleveland, in the place of J. J. Vay, Jr., who is no longer in their employ. Mr. Daw has for several years been a member of the Chicago sales force of the Hanson & Van Winkle Company.

J. J. Vay, Jr., for the past 18 months middle-western manager for the Hanson & Van Winkle Company, has severed his connections with them. Mr. Vay will become head of his own company, and with him will be associated men long experienced in the plating and polishing industry from a practical electrical and chemical engineering standpoint. In conjunction, they will maintain, besides a warehouse at Cleveland, a complete service department and testing laboratory. The office will be at 501 Leader-News Building, Cleveland, Ohio.

Deaths

STEPHEN MESECK

Stephen Meseck, foreman plater for the American Chain Company of Bridgeport, Conn., died suddenly while at work, Monday, November 20, 1922.

A. J. BEATON

A. J. Beaton, formerly of the Beaton & Cadwell Manufacturing Company, manufacturer of metal goods, air valve and plumbing goods, New Britain, Conn., died on October 21 at Norwood, Mass., aged 74.

EDWARD DARLING

As we go to press word comes of the death of Edward Darling, superintendent of the plant of the Aluminum Company of America, at New Kensington, Pa. Particulars will appear in a later issue.

JOHN F. BRADY

John F. Brady died October 27 at the Rhode Island Hospital, Providence, R. I., after an illness of more than a year's duration. He was head of the electro-plating business at 71 Friendship street, Providence, which bears his name, and of the Warwick Sterling Company, 36 Garnet street, Providence.

LOUIS SAPERY

On Sunday, November 5, Louis Sapery, founder of the Syracuse Smelting Works and one of the pioneers in the white metal industry, passed away.

About 35 years ago, Louis Sapery started the manufacture of babbitt metal in the city of Syracuse, N. Y. As the demand for babbitt increased, his business increased, and the Syracuse Smelting Works was formed. This company, which has since become subsidiary to the United American Metals Corporation, makes the famous line of Syracuse and Stanley Process metals, which are now used in every part of the world.

Mr. Sapery was a metallurgist of ability and a recognized expert on babbitt. Although he had been in ill-health for the past year, he was to be found in his laboratory engaged in research work almost every day, and continued active up to the very day of his passing.

In private life, Mr. Sapery was interested in a number of charitable institutions, to which he gave much of his time and material assistance. He leaves a widow and one son.

WILLIAM SARGENT MOORE

William Sargent Moore died November 14 at Chicago, Ill., and was buried November 16 at Union City, Tenn. His age was 60 years.

He had been associated with The Matchless Metal Polish Company, of Chicago, since 1898, and had been secretary of this company since 1920. He was a member of the Chicago branch of the American Electro Platers' Society.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

DECEMBER 1, 1922.

Employees are in demand at all the local brass and metal factories; there is an actual shortage in the supply as contrasted with the hundreds out of work and unable to find any a year ago. The **Chase Companies,** controlling the **Chase Metal Works, Chase Rolling Mill, Waterbury Manufacturing Company** and **Waterville Machine Works,** frankly admitted that the recent five per cent increase in wages granted by them was caused by an actual shortage in labor and not by any superabundance of wealth piled up in the treasury.

Testifying to its healthy condition of affairs and large surplus the **Scovill Manufacturing Company** has trebled its capital stock, increasing it from $5,000,000 to $15,000,000. The proposition was submitted to a special meeting of the stockholders Saturday, November 4th, and unanimously approved by them. The amount of the increase was divided into 100,000 shares of the par value of $100 each.

Following this action by the stockholders, the directors immediately declared a 200 per cent stock dividend, paying for it by transferring $10,000,000 of the present surplus of the company to the capital stock of the account. It is expected that the rate of the regular quarterly dividend will be reduced so that the aggregate amount of yearly dividends on the increased capitalization will be the same as has been paid of late on the present capitalization. The authorization for the increase in stock was granted by the last legislature.

Rumors of the increase had been prevalent for a week or two previous to the announcement and had sent the stock soaring from around 260 to 380. Even then after the announcement was made considerable buying took place, the holders asking 400 but making few sales. The new stock certificates were issued November 30th. Until then the stock remained around 380.

The granting of the stock dividend from the company's surplus again started rumors, prevalent last Spring to the effect that another amalgamation of brass and copper interests was in the works, similar to that of the American Brass Company and the Anaconda Copper Mining Company. The same rapid rise in stock quotations experienced by the Scovill company, was shown in American Brass stock preceding the announcement of the merger. The American Brass company also disbursed its surplus to its stockholders prior to the Anaconda company acquiring control even as the Scovill company has disbursed its surplus.

No confirmation of any of these rumors can be obtained from local brass officials. The first rumor was that the supposed amalgamation was between **Calumet & Hecla, Chile, Inspiration** and other leading copper companies with the **Scovill Company.** The latest rumor is that the amalgamation, if it takes place, will include also all the **Chase** plants here and the **Bridgeport Brass Company** of Bridgeport. This would make a bigger consolidation than the American Brass-Anaconda. The three brass companies mentioned are said to have been purchasing their supply of copper jointly recently and possibly that may have added force to the rumor.

The hectic affairs of the so-called "war baby," the **Eastern Brass & Ingot Company,** have finally reached the conclusion worked for by John H. Cassidy, attorney for some of its creditors. After months of litigation in which Attorney Cassidy continually urged Judge Thomas of the United States District Court to declare the firm bankrupt, the case was heard before a jury in Hartford and the concern declared bankrupt.

Attorney Cassidy was appointed receiver in place of George E. Dalbey who through his attorney had continually contended that the concern was not bankrupt. Attorney Cassidy had made his contention to prevent some of the creditors from having the firm's assets sold, contending that such would constitute a preference for some of the creditors.

The **American Brass Company** has contracted with the Tracy Brothers company to build an additional story to its office building on Meadow street after a plan which was in mind when the original building was erected. In fact, what is now the roof was constructed in such a way that it could be used as a floor for an additional story.

Since the coming together of the concerns which formed the company there has been a gradual but steady consolidation of the different branches so that where originally there were three separate organizations in Waterbury they are all combined under what is now known as the Waterbury branch. In pursuance with this general plan it is now proposed to do more of the clerical work of the eastern branches of the company at the central office in Waterbury and less at the various branches. As soon as the additional story is completed, transfers of certain kinds of clerical work now being done at the offices of the Waterbury branch and at Torrington and Ansonia will be brought to Waterbury, thus bringing the branches into still closer touch with each other and saving much time in telephoning, correspondence, etc. The new building will be completed in early summer.

The **Charles B. Schoenmehl, Inc.,** and the **Blake & Johnson Company** have both increased their capital stocks. The former has increased its stock from $300,000 to $600,000 and the latter has increased its stock from $200,000 to $600,000. Representatives of the two concerns refused to comment on the increases, merely admitting that the increases had been made.

Cornelius F. Kelley, president of the **Anaconda Copper Mining Company,** in an interview locally, declared that the market for copper would be more stable in the next few months owing to the practical ending of war reclaimed copper and brass competition. This will result in a general advance in price of copper and brass products, he said, because as the primary market stiffens the secondary markets follow. The fact that until recently a great deal of war reclaimed copper and brass in the form of shells, wire, sheets, castings, etc., was being remelted and recast without serious quality deterioration, of course, meant that the market for new copper could not help but feel the competition of this secondary copper. This competition was now practically over, however.

Arthur Reed Kimball has been elected a member of the national council and will attend the sessions of the United States Chamber of Commerce at Washington, D. C.

E. O. Goss of the **Scovill Manufacturing Company,** appointed by the governor on the state railroad advisory board, with other members has been holding hearings all over the state on the proposed consolidation of all the New England railroads. Following the state hearings, he attended a joint meeting of the railroad boards of all the New England states in Boston. The joint boards hope to work out a practical scheme of consolidation.—W. R. B.

BRIDGEPORT, CONN.

DECEMBER 1, 1922.

Better industrial conditions have brought hundreds of former Bridgeport men back to the city within the past few

weeks, according to A. Winter, general manager of the **Bridgeport Manufacturers' Association,** and general manager of the **Singer Manufacturing Company.** A slow, sure method of recovery such as is now in progress, he pointed out, would be much more lasting than a sudden rush of better conditions. He estimated that at the present rate of improvement 17,000 more workers will be absorbed in local industries within another year.

One of the first industrial firms in the state to come out openly in favor of a return of the straight five-cent trolley fare for its employees is the **Stamford Rolling Mills.** The plant is just outside the city in Springdale and most of its employees are forced to ride to and from their homes in the city at a cost of 20 cents a day. **Col. L. D. Van Aken,** manager of the concern has announced that the officers feel an excessive fare is being charged to employees and all people riding. In view of the conditions the firm will pay half of each employee's riding expense, the money to be placed in the weekly pay envelope.

Title deeds to the Locomobile property, which went through the bankruptcy courts, have been passed to the new **Locomobile Company of America, Inc.,** of which W. C. Durant is the principal stockholder. A certified check for $1,750,000 has been handed Trustee Elmer H. Havens, which together with $600,000 received from the committee acting under a certain plan and agreement for liquidation of indebtedness to the creditors, will be paid in dividends to the creditors.

The new officers of the concern are: W. C. Durant, president; Elmer H. Havens, vice-president, and H. F. Hebermann, secretary.

One of the most important industrial mergers in the state in years was consummated last month when the **Premier Manufacturing Company** of this placed absorbed the **W. B. Douglas Company,** Middletown's oldest manufacturing company, and the **Standard Metal Works Corporation,** of Thompsonville. The deal involves through the three plants the amalgamation of properties valued at $1,500,000. All the factories will continue to operate as they have in the past, according to **Charles S. Cole,** president of the Premier Company, with headquarters located in Middletown.

The **Bridgeport Brass Company** and the **Union Specialties Company have** become members of the **Employees Tuberculosis Relief Association,** making 13 local factories now belonging to the association. It is at present caring for 45 persons locally who become ill of tuberculosis. Five new cases were reported during the past month, two from the **Underwood Typewriter Company,** and one each from the **Bridgeport Brass Company,** the **Bridgeport Hardware Manufacturing Company** and the **Bryant Electric Company.**—W. R. B.

TORRINGTON, CONN.

DECEMBER 1, 1922.

James B. Cummings has left the employ of the **Turner & Seymour Manufacturing Company** after 55 years' continuous service. When he entered the employ of the company it was known as the Turner & Clark Company. Subsequently it was consolidated with the Seymour Manufacturing Company and in 1874 it became Turner & Seymour. Mr. Cummings' record of continuous active service with one company is said to be unequalled by any other man in Torrington.

The report in the last issue of THE METAL INDUSTRY that certain departments of the Torrington office of the **American Brass Company** were to be moved to Waterbury was confirmed during the past month by an official announcement to the effect that an addition was to be built on the Waterbury office building and that certain departments of all the branch offices were to be moved there.

Mrs. W. S. Rogers, wife of W. S. Rogers, head of the **Bantam Ball Bearing Company,** died suddenly November 20 at Mount Clemens, Mich. Death was due to heart disease.

Murray E. Pendleton, 63, for 34 years with the **Coe Brass** and **American Brass Companies,** died at his home here on November 8, after a long illness.

Walter H. Lawton, 76, who was engaged with the **Coe Brass** and **American Brass Companies** for 35 years, died November 8. He was father of Charles H. Lawton, who is well known in brass manufacturing circles in this section.

ROCHESTER, N. Y.

DECEMBER 1, 1922.

While business in the plants employing non-ferrous metals to a more or less degree has shown gradual improvement during the past two months, the season of the year has nearly arrived when all businesses indulge in a period of quietude. December is the month of final inventory and year-balancing, and already many concerns are feeling the effect of its approach.

The brass foundries of Rochester have been daily busy all fall, and foundrymen feel quite encouraged. Unless the unexpected happens it is believed that soon after the passing of the holiday season the upward movement will be resumed. Just at present foundrymen are obtaining business for present needs, many customers preferring to wait until the New Year and watch for the status of the copper market. Some seem to feel that the price of copper materials will be higher after January 1, in view of the fact that production has been low and stocks depleted during the past few months.

The nickel-plating industry is in a more healthy state this fall than a year ago, owing to a larger output in the stove-making plants.

From Geneva come reports of the plans of the new plant to be established in that city by the Lisk Manufacturing Company. It is said that the new buildings will cover four times the acreage that is now occupied by the Canandaigua plant, and that the output will be five times as great. The Lisk plants will consume an enormous amount of tin, aluminum and brass. The company specializes in anti-rust tinware and the like.—G. B. E.

PROVIDENCE, R. I.

DECEMBER 1, 1922.

There has been a general improvement throughout the entire list of metal trades in this city and vicinity during the past few weeks. There has been a gradual tendency for three months past in this direction but the past month has been more pronounced with the result that the various plants are more active and the daily newspapers are carrying every day a large number of calls for help. This is especially true of the jewelry business and its co-ordinate branches. Some of the shops have even commenced working nights to fill orders for the holidays. The worst feature of the jewelry situation is that the improvement is not a healthy one, and that with the close of the holiday period it is feared that there will be another slump in activity, although there is a very optimistic feeling that with the new year there will be a general improvement along permanent lines.

Holgate & Remington, Inc., has been incorporated under the laws of Rhode Island to take over the refining business of Holgate & Remington and of Baker & Winsor both of this city. The new concern will be located at 189-191 Eddy street in the old plant of Baker & Winsor, which will be increased in size and facilities.

At a meeting of the Engineering Society of the Rhode Island State College on Tuesday, Nov. 14, the process of electro-plating was discussed. **Louis F. Vient,** of this city, a member of the class of '23, in electrical engineering, gave an extended talk on the processes employed by commercial firms. He covered the subject in detail, explaining the chemical reactions, and also the precautions which must be taken in order to insure perfect work.

A charter has been granted to the **Wolk-Lederer Company** of Providence under the laws of Rhode Island for the manufacture of jewelry with a capital authorization of $5,000.

Plans are being completed for the eleventh annual convention of the **American Electroplaters' Society** which will be held in Providence, in July, 1923, with the Providence-Biltmore hotel as its headquarters. The Providence-Attleboro branch will act as host to the national body and will be assisted by the Boston, Bridgeport, Waterbury and Connecticut Valley branches and the general committee will be headed by John E. Garrick as president and Harry Sooles, as secretary-treasurer. This convention will be attended by electroplaters from all over the United States and Canada, and a great educational programme is being arranged for this event.

The **Providence-Attleboro Branch** which was organized in March, 1916, and now has a membership well approaching 75

with Levi J. Perkins as President and Carlton J. Boyton as secretary and treasurer. Meetings are held twice monthly when a comprehensive educational plan is carried out, with lectures and discussions of practical problems. It also holds an annual banquet in December each year, at which speakers of national prominence are invited to address the members and guests and already the officers are at work upon the one to be held in the near future. It is expected that this year's annual will be of more than usual significance and importance because of the approaching convention.

In accordance with the General Statutes the Secretary of State the past month published a list of the corporations that have forfeited their charters because of the non-payment of their franchise tax. Included in the list are the following metal working concerns with the date of their incorporation: William Bens Company, Providence, 1904; Johnson's Brass Foundry Co., Pawtucket, 1918; A. C. Jurgens Company, Providence, 1916 and the National Button Company, Providence, 1900. A majority of these corporations are now out of business.

The Rhode Island Sheet Metal Works, 191 Prairie avenue is owned and operated by Morris Jagolinzer, according to his statement filed at the city clerk's office.

W. H. M.

TRENTON, N. J.

DECEMBER 1, 1922.

The metal industries in Trenton report business as being very brisk and the prospects for the present winter are very good. The **John A. Roebling's Sons Company** have placed additional hands at work at both the Trenton and Roebling, N. J., plants. At the latter place night forces have been placed at work. The company also recently granted increases in wages to all hands. The **Skillman Hardware Manufacturing Company, Billingham Brass & Machine Company, McFarland Foundry & Machine Company, Trenton Brass & Machine Company and Trenton Emblem Company** all report business brisk.

The **Keystone Watch Case Company,** which closed its factory some time ago, has reopened the plant. There are now 1,100 hands employed at the factory and more than 1,600 watch cases are being turned out every day.

The **Elgin Jewelry Company,** of Newark, has been incorporated at Trenton with $100,000. Philip J. Schotland is head of the concern.

The **Aluminum Wheel Company of America,** recently organized to manufacture an aluminum automobile wheel, will erect a plant in New Brunswick. The company has already let a contract with the Hamilton & Chambers Company, of New York, for the erection of the factory. The main plant will be 50 by 200 feet. George L. Snedeker, of Highland Park, proprietor of the New Brunswick Brass foundry, is one of the directors of the new company. He is well known in the metal industry.

Philip J. Warner has been appointed receiver of the **Atriken Chemical Works,** of Orange street, Newark, on complaint of the **Aluminum Cooking Utensil Company.**

Hiram Watch Company, of East Orange, has been incorporated at Trenton with 10,000 shares no par to deal in jewelry.

The **Bearing and Odometer Corporation,** of Newark, has been incorporated at Trenton with $25,000 capital to make odometers. Seymour J. Solomon is president of the concern.

Vargyas Engineering Corporation, of Newark, has been incorporated at Trenton with $100,000 capital to make electrical devices. William J. McFadden, of Newark, filed the incorporation papers.

Arlington Bed Corporation, of Newark, has been incorporated at Trenton by Leo Schrafran with $10,000 capital to manufacture metal beds.

C. A. L.

CLEVELAND, OHIO

The **Ohio Brass Company** has broken ground for a new building in connection with its malleable iron foundry. This structure will house the sand blast, pickling, galvanizing and inspection department handling malleable iron. The new building will be the malleable foundry building. It will be of steel and brick construction, approximately 50 x 120 feet and absolutely fireproof throughout.

The **Maumee Metal Parts Company** has purchased through the **George B. Ricaby Company,** the office building of the **Huebner Toledo Brewing Company** at Hamilton street and the New York Central tracks, and 120 feet of property adjoining the building. The building is being remodeled for manufacturing purposes. The present plant is at 1604 Oakwood. The new plant will give the company six times its present floor space. The working force will be increased to more than 100. The plant manufactures aluminum castings. The cost of the property just purchased was $40,000.

The **New Haven Sheradizing Company** will locate in Akron at 917 Sweitzer avenue, in a building of 9,000 square feet which will be the first unit of a future plant. Operations are expected to begin early in December. A. F. Schoen is general manager. The removal from New Haven to Akron was made because this city is the more strategic point with reference to the company's customers.

The aluminum plant being built by **O. H. Sebring** is making good progress. The steel framework is all in position. The steel sash and roof supports are placed and the work of putting on the roof has been begun. It is expected to have the shop in operation by January 1.

The **Buckeye Iron and Brass Company,** East Third street, was exonerated of patent infringement in a suit brought by Alfred W. French and the French Oil Company in Federal court, by Judge Sater's decision. Judge Sater declared he could find no evidence of infringement.

INDIANAPOLIS, IND.

DECEMBER 1, 1922.

Equipment costing approximately $100,000 will be installed in the new wire enameling plant of the **Dudlo Manufacturing Company** at Fort Wayne, Ind. The plant is nearing completion. The new addition will provide much needed room for expansion of the business. The addition will be put on full production as soon as possible, according to G. A. Jacobs, general manager of the plant. Recently it was thought that because of a shortage of copper wire, the plant would have to shut down. Some cars were lost in Chicago yards and it seemed a suspension would be necessary. The cars arrived in Fort Wayne in time to prevent a complete suspension.

Assistance to the foundries of Indiana in solving some of their problems is being given by the engineering extension department of **Purdue University,** through the gradual expansion of the engineering extension work. **R. E. Wendt,** for seventeen years a coremaker, molder, cupola operator and for the last ten years on the instructional staff at Purdue, has been devoting the entire summer to this work. He has visited many foundries, studying problems of the men and owners and offering suggestions here and there for changes and improvements. He will continue the work during the next vacation season.

A better trend in the foundry business during the last three months is reported by **John Kinsley,** of the **Kinsley Foundry Company** of Indianapolis. Future prospects in the trade appear encouraging and the company is expecting a continued improvement in business, he said.

Fire which started in the shipping room of the **Dalton** foundry at Warsaw, Ind., recently, did damage estimated at more than $10,000. Explosion of a tank of gasoline caused the fire to spread rapidly.

Business in the plating trade is showing a steady improvement from month to month and the growing popularity of modern plating methods indicates a continued increase, according to **William P. Cangany,** president of the **Cangany Plating Company** of Indianapolis. The company recently occupied larger quarters because of increased business since its organization two years ago.—E. B.

MONTREAL, CANADA

DECEMBER 1, 1922.

Business for the past month has been very good, and should it maintain the October record it will give a fairly satisfactory ending to a year that has been marked by many retarding influences.

Car shortages are now developing on Canadian lines and may prove a handicap to industry generally. There has been no railway buying apart from that arising from immediate needs but reports from manufacturers indicate that there is likelihood of a loosening up on freight car and engine construction for both National and C. P. R. lines. The building industry has been the basis for considerable business but this is bound to slacken with the arrival of cold weather. There has been a heavy demand this past month for plumbing and steam brass goods, also builders' hardware.

The **International Radio Manufacturing Company** are now fully established in their new factory at 373 Aqueduct Street, and J. Young, the superintendent, reports quite a demand for the machines they are placing on the market.—P. W. B.

BIRMINGHAM, ENGLAND

NOVEMBER 17, 1922.

Business in the metal trades continues to improve. While the majority of firms are still not more than two-thirds employed, there are a few which are working overtime in the brass trade, particularly those engaged upon water fittings. Business has again reopened with Holland and it is believed that continued progress is now assured towards the restoration of the valuable trade which for two or three generations before the war was done by Birmingham brass founders in and through that country. Business in electroplate has improved considerably and many firms are now working full time. The bulk of the trade is in spoons and forks and other utility articles, but there is a fair demand for the more expensive wares. Silversmiths also have become fairly busy. The jewelry trade, beyond a certain seasonal demand, has experienced practically no improvement. Aluminum hollow-ware manufacturers find business slowly improving. Imports from Germany have fallen off, not so much it is thought on account of the duty imposed under the Safeguarding of Industries Act, as because of German internal conditions. British firms are also profiting by the growing preference of buyers for more substantial and better finished aluminum ware. In the bedstead trade there is little improvement of the export situation, but some headway has been made at home in inducing the public to prefer brass to wooden bedsteads. With this object a number of new standard patterns, designed to harmonize with the current taste in furniture, has been put on the market by the federated manufacturers. Metal prices remain firm and demand for scrap is improving. Spelter continues to increase in price. The rolling and tube mills have had some slight increases of business, but are still by no means fully employed.

Business Items Verified

The **Ontario Knife Company,** Franklinville, N. Y., states that the rumor that they have erected an addition to its plant is an error.

Announcement is made that the **Ira Lee Suction Cleaner Corporation,** Detroit, will remove to a new factory at Royal Oak, Mich.

The **Superior Auto Accessory Company,** 1342 Forbes street, Pittsburgh, has leased a site at Baum Boulevard and Woodworth street for a new one-story plant.

The **American Building Foundry Company,** 2300 South Springfield avenue, Chicago, has let the contract for the erection of a plant addition, to be 35 x 93 feet.

The **Charles K. Schweitzer Company,** St. Louis, Mo., announces its removal to larger quarters, with office at 207 Vine street and works at 501 North Second street.

The **New Haven Sherardizing Company,** Hartford, Conn., is contemplating opening a branch at Akron, Ohio. The main plant will still be located at Hartford, Conn.

The Seaboard Brass & Copper Company, Baltimore, Md., will do a general jobbing and retail business in brass and copper rod, sheet, wire, fittings, babbitt metal, etc.

The **Brown Instrument Company** announces the opening of its New England branch at 185 Devonshire street, Boston. This is a sales office. George Goodman is in charge.

The **National Screw & Tack Company,** Cleveland, is having plans prepared for a five-story addition to relieve some of the congestion that now exists in the various departments.

The **Black & Decker Manufacturing Company's** branch office and service station, formerly located at 318 North Broad street, has re-located, the new address being 824 North Broad street.

The **Johnston & Jennings Company,** Cleveland, Ohio, has taken over the entire molding machine business of the U-S Molding Machine Company and will continue to build and market their machines.

The **W. R. Hughes Company, Inc.,** 507 West Thirty-fifth street, New York, recently leased a factory at Irvington, N. J., for the exclusive manufacture of lacquers and lacquer enamels and also spraying equipment.

The **Springfield Bronze Company,** Springfield, Mass., has let the contract for the erection of an addition to its foundry, 30 x 40 feet. This firm operates the following departments: Brass, bronze and aluminum foundry.

The **Corcoran Pressed Metal Company,** Indianapolis, Ind., filed final certificate of dissolution. It is now operating as the Chalfant Can Company. This firm operates the following departments: Rolling mill, stamping, tinning, soldering and polishing.

The **Plaza Metal Bed Company,** 5 La Grange street, Brooklyn, will make improvements and extensions in its three-story plant for general increase in manufacture. This firm operates the following departments: Grinding room, cutting-up shop and welding.

Erection of an addition to its plant is being planned by the **Buffalo Bronze Die-Casting Company,** 90 Arthur street, Buffalo, N. Y. This firm operates the following departments: Brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room.

The **Badeker Manufacturing Company,** manufacturers of metallic packing, 212 North Shelton street, Chicago, has let contract for a one-story factory, 50 x 180 feet, at 4612 Park avenue. This firm operates the following departments: Brass machine shop and tool room.

Contract has been let by the **Belknap Manufacturing Company,** Bridgeport, Conn., for the erection of a two-story foundry addition, 25 x 60 ft. This firm operates the following departments: Brass, bronze foundry, brass machine shop, tool room, grinding room and plating.

The **Highland View Manufacturing Company,** Marwood, Pa., manufacturer of metal specialties, is said to be arranging a list of tools for its addition, now in course of construction. This firm operates the following departments: Grinding room, plating, stamping, tinning and polishing.

The **Hayes Brass Foundry,** 132 Richmond avenue, Syracuse, N. Y., which was recently incorporated, has a fully equipped foundry for turning out quantities of castings, etc. C. H. Hayes heads the company. This firm operates the following departments: Brass, bronze and aluminum foundry.

Hugh F. Munro & Sons, 1737 North Fifth street, Philadelphia, operating a sheet-metal working plant, are said to be arranging a list of equipment for installation at their proposed two-story and basement plant, 50 x 60 feet, at 1745-51 Bodine street. Plans are held off until spring of 1923.

Great Western Meter Company, Emeryville, Cal., has awarded contract to H. P. Nelson, 1947 Blake street, Berkeley, Calif., for a new one and two-story plant, estimated to cost $30,000. This firm operates the following departments: tool room, japanning, stamping, polishing and lacquering.

Mid-City Foundry Corporation, 1901 S. Rockwell street, Chicago, Ill., has taken over the foundry plant formerly operated by Henry E. Pridmore, manufacturers of molding machines, whose gray iron castings they are making. They are also doing a general foundry jobbing business.

The **Underwood Typewriter Company,** Hartford, Conn., has purchased from the Johns-Pratt Company, that city, property on Capitol avenue, consisting of six main manufacturing units, containing about 92,000 sq. ft. floor space, a boiler plant and engine room. The price was approximately $125,000.

The **Solarine Company,** Emerson Building, Baltimore, Md., manufacturer of metal polishes, etc., has awarded a contract to Frainie Bros. & Haigley, 19 West Franklin street, for the erection of its proposed one-story plant at Eagle and Smallwood

streets, estimated to cost close to $100,000, including machinery.

Atwood Brass Works, Inc., Grand Rapids, Mich., have just completed a new addition to its plant on Front avenue and Sixth street, which is to be used for brass foundry. This firm operates the following departments: Brass foundry, brass machine shop, pattern department, polishing, plating and japanning.

The **Bantam Brass Manufacturing Company,** of Bantam, Conn., has erected a building 70 feet long and 20 feet wide to make brass, bronze and aluminum castings. The proprietors are Herman Foster and George F. Molitor, both with long practical experience in the foundry and metal manufacturing business.

Atlas Brass Foundry Company, Los Angeles, Cal., are building a 1-story foundry building 36 x 75 ft., also a 2-story office building 16 x 24 ft., at 1901-3 Sante Fe avenue, Los Angeles, Cal. Building will be completed about December 15th. They operate a jobbing foundry, making brass, bronze and aluminum castings.

The **Norwalk Iron Works Company,** pioneer builders of compressors, manufacturing air and gas compressors for all purposes and also refrigerating machinery, with general offices and works, South Norwalk, Conn., has just opened a Chicago office. It is located at 627 West Washington Boulevard. Mr. L. R. Bremser is in charge.

The **H. B. Ives Company,** New Haven, Conn., manufacturer of hardware products, has awarded a contract to Sullivan & McKeon, New Haven, for a four-story addition, with one-story wing extension, 30 x 80 feet. This firm operates the following departments: Brass, bronze and aluminum foundry, polishing and lacquering.

The **Hanlon-Gregory Galvanizing Company,** 24th street and Alleghany Valley R. R., is completing plans for the construction of a new 1-story plant at 56th and Butler streets, 100 x 400 feet to be used for the manufacture of galvanized metal products. It will cost about $100,000. They operate a galvanizing and tinning department.

Wilson Welder & Metals Company, 132 King street, New York, are now represented exclusively in Maryland, Virginia, and the District of Columbia, by the Alexander Milburn Company of Baltimore. A large stock of color-tipt welding metals and plastic-arc welding machines is available at this point for distribution throughout the territory and a complete demonstration plant in operation.

The **Gurney Refrigerator Company,** Fond du Lac, Wis., manufacturer of iceboxes, will start work immediately on a three-story addition, 60 x 150 ft., and extensions of the engine room and boiler house, the work to cost approximately $100,000. F. J. Stepinski, local architect, is in charge. A miscellaneous list of machinery, largely for wood and sheet metal working processes, will be required.

The **Coppus Engineering & Equipment Company,** Worcester, Mass., has purchased all the stock and good-will of the New England Brass Company, and merged the two under one corporation. The new corporation will take over intact the business of the two companies and will operate them along the present lines. This firm operates the following departments: Bronze and aluminum foundry.

The **Manufacturers' Polishing & Platers' Supply Company,** Inc., has located a factory in Bridgeport, Conn. It will manufacture a full line of platers' supplies including bulbs, cleaners, emery, felts, chemicals, rouge, pumice stone, putty powder, tanks and all kinds of polishing wheels. Harry H. Bristol is president, G. A. Skidmore, long with the Ayer-O'Connell Manufacturing Company, of Meriden, is superintendent.

The **Pennsylvania Silverware Company,** Kane, Pa., recently organized, has acquired the local plant and business of the Oneida Fountain Supply Company. Production will be continued in this line, with the addition of metal and silverware specialties. Increased capital has been arranged for expansion. This firm operates the following departments: Casting shop, spinning, plating, stamping, soldering, polishing and lacquering.

The **Western Die-Casting Company,** Berkeley, Cal., has erected a one-story plant, 125 x 162 feet, on Napa street, Vallejo, Cal., and is in operation. It is constantly in the market for all supplies and metal pertaining to a die-casting company, and would be pleased to receive quotations for metals to be used in the making of dies and also for castings. This firm operates the following departments: Machine shop, tool room, grinding room, blue-print shop and casting shop.

The Advance Pattern & Foundry Company, 2734 West Thirty-sixth Place, Chicago, are building two additions, one covering approximately 25 x 125 feet, to be a one-story furnace room, the other being a two-story building covering a space approximately 40 x 125 feet. This building will accommodate the following departments: Grinding, shipping, polishing, core room, pattern shop, wood and metal pattern. Their line of manufacture is confined exclusively to that of aluminum castings, in connection with which they are operating a general wood and metal pattern shop.

Equipped for making castings in bronze, brass or aluminum in any size or quantity, the **Phoenix Brass Foundry,** Irvington, N. J., recently completed its new foundry building. The company maintains a large shop for machining, finishing and assembling, as well as a pattern shop for either wood or metal patterns. With office and works at 857 Springfield avenue and foundry at Cordier street and Chancellor avenue, the company now is prepared to do floor, bench or machine molding from architectural bronze to production work. This firm operates the following departments: Brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop, brazing and stamping.

Announcement is made of the change in corporate name of the **Wire Goods Company,** Worcester, Mass., to the Washburn Company. The Wire Goods Company was recently inincorporated with capital stock of $1,000,000, and has taken over the business of the Cassady-Fairbanks Company, Chicago, and the Andrews Wire & Iron Works, Rockford, Ill., together with the Andrews Wire & Iron Works of Canada, Ltd. The American companies will be known as the Wire Goods Company division, the Cassady-Fairbanks Company division and the Andrew Wire & Iron Works division. The main office of the company will be at 28 Union street, Worcester. This firm operates the following departments: Galvanizing, brazing, plating, japanning, stamping, tinning, soldering, polishing and lacquering.

INCORPORATIONS

The **Aluminum Products Company,** Boston, Mass., has been incorporated with a capital of $25,000, to manufacture aluminum and kindred metal products.

The **General Die Casting and Machine Company,** 2535 North Ashland avenue, Chicago, Ill., has incorporated, and is increasing its premises and adding to its equipment. The work is confined to die castings and dies.

Parker Metal Goods Company, Worcester, Mass., metal goods, was recently incorporated with a capital of $50,000; incorporators, A. H. Parker, G. H. Mirick and Josephine M. Lindsay, all of Worcester. This firm operates the following departments: Tool Room, japanning, stamping and lacquering.

The **Trumbull Tube Company,** Warren Ohio, has been incorporated with a capital of $40,000. It is in the market for bolts, nuts, screws, galvanized drying pans, enameled drying pans, thermometers, door pulls, hinges and refrigerator door fasteners. This firm operates the following departments: Tool room, japanning, polishing and lacquering.

Robert J. Gray, 135 Dart St., Buffalo, N. Y., has made application to the city council for permission to equip a building at the location noted for a sherardizing plant, for zinc galvanizing and kindred work. He is not starting the plant just now, but may at a later date. He is after second-hand 5 horse-power gas heated steam boiler and some wood pickling tanks with pickling baskets.

Paragon Disk Wheel Company, 254 Hawthorne avenue, Portland, Ore., has been incorporated with a capital of $100,000 to manufacture metal wheels for automotive service. During the last two years the company manufactured Paragon steel disk wheels under the name Wilkinson Bros. This firm operates the following departments: Cutting-up shop, spinning, japanning, stamping, polishing and lacquering.

BUSINESS TROUBLES

Notice has been given that the trustee offered for sale the property of the **Pfau Manufacturing Company,** bankrupt, located at Cambridge, Ohio, and at Norwood, Cincinnati, Ohio, on November 20 and 24 respectively.

METAL PRODUCTION DECREASED

According to London computations, annual consumption of the so-called non-ferrous metals has decreased since the war more than it increased during the war-time over the pre-war average. The five principal metals of the sort show the following annual production during the designated periods:

	1912-13. Tons.	1914-18. Tons.	1919-21. Tons.
Copper	1,019,000	1,278,000	812,000
Lead	1,202,000	1,179,000	878,000
Zinc	988,000.	906,000	600,000
Tin	129,000	128,000	116,000
Aluminum	65,000	123,000	136,000
Total	3,403,000	3,614,000	2,552,000

Consumption of the same metals has decreased in some cases even more rapidly since the war than production has done. The comparison of average annual consumption by periods is as follows:

	1912-13. Tons.	1914-18. Tons.	1919-21. Tons.
Copper	1,067,000	1,295,000	789,000
Lead	1,207,000	1,164,000	894,000
Zinc	1,009,000	901,000	605,000
Tin	129,000	122,000	106,000
Aluminum	65,000	129,000	133,000
Total	3,477,000	3,611,000	2,527,000

It is pointed out in connection with these estimates that in the two years before the war Europe was still the workshop of the world, consuming no less than 62 per cent of the world's production of these metals. During the war period, however, Europe's consumption declined to 49 per cent of the world's output and in the two years after the war it stood at only 43 per cent.—New York Times, November 20, 1922.

DETROIT ELECTRIC FURNACES INSTALLED

The Detroit Electric Furnace Company has on order one 2,000 lb.-300 KVA. Detroit Electric Brass Melting Furnace for the Ford Motor Company, Highland Park, Michigan. This furnace when installed will complete a battery of eight 2,000 lb. furnaces in the brass foundry of the Ford Motor Company. These furnaces are expected to handle the entire brass melting requirements of the Ford Company.

The Detroit Company is also installing a battery of three Detroit furnaces in the plant of the Neptune Meter Company, Long Island City, New York, who manufacture water meters of all types for various purposes. This battery of furnaces is replacing the pit fires and oil furnace equipment now in use.

Other installations now being made by the Detroit Electrical Furnace Company are one 2,000 lb. furnace in the plant of the Tottenville Copper Company, Staten Island and one 500 lb. furnace in the United States Arsenal, Watertown, Massachusetts. With the exception of the furnace at the Watertown Arsenal all of the installations above mentioned are equipped with automatic electrode control which eliminates the necessity of an operator in attendance at the furnace.

BRONZE TRAFFIC TOWERS

The Fifth Avenue Association of New York has given to that city seven bronze towers to be used as signal towers for traffic regulation on Fifth Avenue, where traffic is so heavy.

The four legs which support the twenty-five-foot structure have been cast solid, an achievement in foundry development. Heretofore bronze castings have been made in sectional moulds and joined together with more or less evidences of jointing.

The traffic signals will stand on solid uprights terminating in symbolic winged hoofs also of bronze, which in turn rest on bases of Milford granite. Eagles with spreading wings are poised on the four corners near the top. Above these eagles and encircling the upper part of the tower are conventionalized torches with flaming beacons framing the signal lights. On the low spreading base just above the street rests a block of granite about three feet high. This is gripped by the four winged hoofs which enclose its corners. Hand-carved garlands of flowers encircle the four sides.

MANUFACTURE OF ALUMINUM

WASHINGTON, D. C., Nov. 2, 1922.—The Department of Commerce announces that the census reports show a considerable decrease in the activities of the establishments engaged in the manufacture of aluminum products during the year 1921 as compared with 1919. The total value of products reported for 1921 amounted to $45,822,000, and for 1919 to $75,278,000, a decrease of 39.1 per cent. An additional production amounting to $1,847,000 in 1919 was reported by establishments engaged primarily in the manufacture of other products, principally brass, bronze and copper products. Corresponding figures for 1921 are not available.

The returns indicate that the combined output of all establishments was approximately 50 per cent of the maximum capacity, based upon a demand requiring full running time.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$420	$460
American Hardware Corporation	100	218	...
Bristol Brass	25	15	20
International Nickel, com.	25	13½	14
International Nickel, pfd.	100	...	75
International Silver, com.	100	35	...
International Silver, pfd	100	101	104
New Jersey Zinc	100	160	165
Rome Brass & Copper	100	110	130
Scoville Manufacturing Company, new	...	122	126
Yale & Towne Manufacturing Co., new	...	50	52

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

TRADE PUBLICATIONS

Budgeting for Business Control—A pamphlet issued by the Chamber of Commerce of the United States, Washington, D. C. Some of the advantages of budgeting are set forth.

Link-Belt Crawler Crane, No. 595—A folder issued by the Link-Belt Company, 910 S. Michigan avenue, Chicago, Ill., describing and illustrating their Link-Belt crawler type crane.

Monel Metal—In Hospital Equipment—A bulletin issued by the International Nickel Company, 67 Wall street, New York City, showing how Monel metal is used for hospital equipment.

Training Required for the Industrial Arts—A booklet issued by the Industrial Arts Council, 599 Fifth avenue, New York City, setting forth the great need for more and better training in design and craftsmanship.

Monel Metal; Hotel, Restaurant and Cafeteria Applications—Bulletin 104, issued by the International Nickel Company, 67 Wall street, New York City, showing Monel metal in hotel, restaurant and cafeteria equipment, food and beverage appliances and kindred applications.

Chase Condenser Tubes—A booklet issued by the Chase Metal Works, Division of Chase Companies, Inc., Waterbury, Conn., illustrating and describing the manufacture and specifications of their condenser tubes. It is attractively illustrated and makes very interesting reading.

Anodes, Plating Salts and Chemicals.—Bulletin No. 600 issued by A. P. Munning & Company, Matawan, N. J. The bulletin illustrates and describes a number of different shaped anodes, particularly the Quoit anode. It also contains considerable information on plating salts and chemicals.

Midwest Steel Sections—Architects and engineers' data book. A catalog issued by the Midwest Steel & Supply Company, Inc., 28 West Forty-fourth street, New York, comprising box rails, L rails, and steel stringers for the anchorage and support of machinery, motors, overhead transmission, pipes, cables, etc.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Domestic consumption of copper is much larger than a year ago and exports for the first ten months of this year are estimated at about 25% ahead of the foreign outgo for the first ten months of 1921. Thus the volume of home and foreign demand is well above the levels reached last year. Nevertheless, present market prices in New York are barely an ⅛ to ¼ cent per pound higher than they were a year ago.

The statistical position of copper has improved greatly since January 1. There has been a heavy reduction in surplus supplies in producers hands, and the undistributed accumulation is probably not much more than 270,000,000 pounds on December 1st. Recent decrease of refined stocks proceeds on a comparatively small scale, and it seems quite probable that in the near future current production will equal approximately domestic consumption and exports. This makes for an easy market tendency and leads consumers to expect ample supplies so long as present conditions last.

Sales of copper in November were in fairly good volume on the electrolytic basis of 13¾c to 13⅞c, with shipments over balance of this year and in some instances extending into first quarter of 1923. A few orders were taken at 14 cents delivered but purchases of electrolytic appear to be quite possible at 13⅞c delivered. Casting grades quote 13⅜c to 13½c for round lots.

Although manufacturing business is active and on a satisfactory basis the market for the raw product remains in a subnormal state. This is owing to the fact that South America has increased its shipments of copper to this country at a rate that offsets other favorable features in the situation. Chile is particularly active in developing the low cost properties in that country where workers live in such a primitive way as to place labor conditions in a class radically different from what prevails here. This notable difference makes it impossible for this country to compete with South America on costs.

ZINC

There was a fluctuating market in zinc recently, with a downward tendency in both this and the foreign markets. This development gave rise to considerable unsettlement and uncertainty in minds of buyers. Prices yielded from the previous high levels, but since then the market has reversed itself and is now showing a firmer tone at 7.35c New York and 7c E. St. Louis. Active sympathy has developed between the domestic and foreign markets. There was moderate buying at recessions on the basis of 6.80c to 6.85c for deliveries over next two to three months. London cables report recent important advances in price. America has made shipments for foreign account, and it is felt that the position here will be stronger in consequence of these exports. New inquiries have appeared and business is expected to develop therefrom in a short time.

TIN

There has been a decided reduction in the volume of sales of tin at London recently. Speculative enthusiasm is less apparent in the English market, but the tone is fairly steady both here and abroad. London sales in the first half of November were exceptionally heavy. A number of buyers were attracted to the market here whenever the offers appeared at reasonable limits. Spot supplies here are held at a premium, and being in strong hands buyers are compelled to pay fancy prices.

The market closes steady at 36¼c for spot Straits and and 36¼c@36½c for delivery next two months. There are substantial qualities of Chinese tin in this market, and this grade quotes 35¼c to 35½c for prompt delivery and 35⅛c for futures. Banka quotes 35¾c to 36c but is rather neglected by buyers at present. Consumers and dealers have displayed caution in making important commitments ever since bullish operations started in London. They have considerable supplies contracted for to arrive, however, and the afloat shipments amount to 9,260 tons as per latest statistics at hand.

LEAD

A large business was done in lead during November on a rising price schedule. Buyers placed orders freely, and offerings were eagerly accepted for shipments up to the end of February. The market displayed a strong upward trend, with prices advancing from 6.50c to 7.10c New York basis, as per American Smelting & Refining Co.'s quotations. The outside market quotes 7.25c to 7.35c New York, with East St. Louis basis 6.95c to 7.00c per lb.

Since September 1, 1921, the official price for desilverized lead has been advanced 22 times without a single reaction. During this period the market advanced by intervals from 4.50c to 7.10c New York delivery. The market closes strong, with good demand and prospects of further advances.

ALUMINUM

Prices of aluminum have been advanced by the leading domestic sellers about 2 cents per pound including prompt and future shipments extending into first half of next year. The outside market quotes 22c to 22½c for 99% virgin f. o. b. New York terms, 21c to 22c for 98-99% virgin and 20½c to 21c for remelted material of 98-99%. There were recent offers of foreign aluminum on basis of about 16c c. i. f. New York for 98-99% grade. There was some business in French product lately. France and Germany are larger consumers of aluminum than formerly. Those countries have consequently less metal to offer in this market. According to current reports the price now quoted for ingots by the Aluminum Company of America has been further advanced to 25 cents per pound, circles and other shapes on a corresponding scale.

ANTIMONY

Demand for antimony is on a small scale. Holders, however, are not inclined to openly offer regulus under 6.40c to 6.50c in 25-ton lots. But there are indications that these figures would be shaded if business seemed probable. The market has drifted into a period of comparative inactivity.

QUICKSILVER

Imports of foreign metal were small in November, but stocks arriving before the new tariff went into force are awaiting sale. Market prices are irregular and inquiries limited. Recent sales were made at $70 and $70.50 per flask. Domestic producers claim they cannot compete on this basis, and when foreign stocks are disposed of the market is expected to show some advance. Regular quotations are $71.00 to $72.00 per flask.

PLATINUM

There is a better tone to this market and a fair inquiry from usual trade sources. Virgin metal is now held at $103 to $105 an ounce and remelted at $101 to $102 an ounce. There are no imports from Russia for considerable time. Russian exports first six months of 1922 were 24,629 ounces. In 1913 exports from Russia amounted to 20,033 ounces. Exports from Columbia first half of this year were 15,903 ounces, against 1,250 ounces in 1913.

SILVER

All markets for silver reveal more pronounced weakness. London is recognized as the dominant influence in fixing the trend of prices at present. The opinion of London operators has been bearish for some time past, and a further factor affecting the white metal is the attitude of Chinese speculators. Latest quotations at hand as we go to press were 63¼c New York and 31⅞d London. These prices compare with 74¼c and 37⅜d respectively as the high range in 1922.

Expert authorities are of opinion that strong buying by China is necessary to turn the market on a genuine upgrade movement. Government purchases under the Pittman repurchase act amount to a total of over 142,000,000 ounces, leaving a balance of domestic silver to be purchased of about 66,000,000 ounces.

OLD METALS

The market for scrap metals enjoyed highly favorable developments lately, but more recently business does not appear to be moving in such volume and prices for some metals have to be shaded in order to move stocks freely. Buyers are more conservative in making heavy purchases. The lead scraps are naturally firm and have commanded top prices. Copper and brass scraps have inclined to hover around a stationary level, and this is not surprising in view of the lassitude displayed in the market for virgin metal. A fair business, however, is recorded for November, but a reasonable caution is now in evidence. Dealers' buying prices are about as follows: Heavy cut and crucible copper 12c to 12½c, heavy wire 11¼c to 11¾c, heavy brass 6c to 6½c, aluminum clippings 14½c to 15½c heavy lead 6c to 6¼c, zinc scrap 4¼c to 5c, light brass 5¼c to 5½c, and composition scrap 8¾c to 9c.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President, Whitehead Metal Products Company, Inc., of New York

During the month of November a noticeable falling off in new business was reported by some of the brass and copper mills, as well as by some of the jobbers, although it was not apparent at any time that this was general throughout the trade. In some specific lines there seems to have been somewhat of a lull in the purchasing, but at no time, has anything appeared which might be characterized as being in the nature of a general slump or anything that would give rise to any feeling of alarm as to the business conditions generally. There is some improvement in deliveries of some lines of material, although there is still a considerable delay attached to the execution of orders for sheet copper, seamless tube and sheet brass.

Freight embargoes and the labor situation still continue to be very troublesome factors in most quarters, and in the Connecticut Valley, especially, it is said that the labor situation is giving the mills a great deal of concern. The complaints are to the effect that there is a terrible shortage of the right kind of help and while there is a large number of men employed, the efficiency is comparatively low because of the character of the help and the real scarcity of good men. It is said that increases in wages do not help the situation very much as the material to work with is simply not there and it does not seem to be possible to develop it with any degree of speed. The feeling is, that unless there is some change in the immigration laws it will be only a short time when it will be absolutely impossible to get any common labor, whatever, that has the willingness to do a full day's work.

Some of the mills advise that during the last week of the month there has been a rather heavy increase in the number of orders placed, particularly, by the concerns using heavy tonnages of material who are anxious to assure themselves of their supply for the requirements which will have to be met during the first three or four months of next year. In order to assure themselves of these supplies, and to anticipate delays in delivery, many of the large concerns, notably in the automobile industry are placing very heavy tonnages with the expectation that next year will be another banner year and that their consumption will be heavy.

The price situation has become stabilized and no immediate revision in price, either upward or downward is looked for in the near future. Some of the manufacturers have expressed the opinion that there are inequalities in the price schedules as now published and that on some items prices should be increased, but no one wants to take the lead in issuing a new schedule with increased prices, and, therefore, no change is expected to be made very soon.

Orders for Monel metal and nickel, also nickel alloys continue to be plentiful and deliveries from the International Nickel Company's new mill at Huntington, W. Va., are being made at a very rapid rate. Shipments of Monel metal, however, have not begun to keep pace with the orders, but with the steadily increasing efficiency of the Huntington mill. it is expected that very shortly it will be possible to secure all sizes of Monel metal and nickel sheet, rod, tube and wire promptly.

WATERBURY AVERAGE

Lake Copper—Average for 1920, 13.136. January, 1922, 13.875—February, 13.375—March, 13.125—April, 13.00—May, 13.375—June, 14.00—July, 14.125—August, 14.125—September, 14.25—October, 14.25—November, 14.125.

Brass Mill Zinc—Average for 1920, 5.175—January, 1922, 5.25—February, 5.00—March, 5.10—April, 5.40—May, 5.55—June, 5.85—July, 6.20—August, 6.50—September, 7.10—October, 7.65—November, 7.90.

Daily Metal Prices for the Month of November and December 1, 1922

Date	1	2	3	6	7	8	9	10	13	14	15	16	17
Copper (f. o. b., Ref.) c/lb. Duty Free:					Holiday								
Lake (Delivered)	14.25	14.25	14.125	14.125	.....	14.125	14.125	14.125	14.125	14.125	14.125	14.125	14.125
Electrolytic	13.75	13.625	13.625	13.75	.....	13.75	13.75	13.75	13.875	13.875	13.875	13.875	13.875
Casting	13.40	13.40	13.40	13.40	.....	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.075	7.075	7.075	7.075	.....	7.125	7.15	7.25	7.30	7.30	7.30	7.30	7.30
Brass Special	7.175	7.175	7.175	7.175	.....	7.20	7.25	7.35	7.40	7.40	7.40	7.40	7.40
Tin (f. o. b. N. Y.) c/lb. Duty Free:													
Straits	36.25	36.25	37.25	38.00	.....	36.875	37.50	37.50	37.00	36.875	37.125	36.50	36.375
Pig—99%	35.50	35.75	36.50	37.25	.....	36.25	36.875	36.875	36.375	36.25	36.375	35.75	35.75
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.55	6.85	6.85	6.875	.....	6.875	6.875	6.90	6.95	6.95	6.95	6.95	6.95
Aluminum, c/lb. Duty 5c/lb.	21	21	21	21	.....	21	21	21	22.50	22.50	22.50	22.50	22.50
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	36	36	36	36	.....	36	36	36	36	36	36	36	36
Outside Spot	32-34	32-34	32-34	32-34	.....	32-34	32-34	32-34	32-34	32-34	32-34	32-34	32-34
Electrolytic (Internat. Nick. Co.)—													
Ni—99.80 contam. impurities—.14.	39	39	39	39	.....	39	39	39	39	39	39	39	39
Brit.-American Nick. Corp.—													
Ni—98.50, contam. impurities—.80.	33	33	33	33	.....	33	33	33	33	33	33	33	33
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.65	6.65	6:60	6.60	.....	6.60	6.60	6.60	6.60	6.60	6.60	6.50	6.50
Silver (foreign) c/oz. Duty Free	67.00	67.25	66.875	67.75	.....	66.25	66.125	65.25	65.50	65.375	64.625	63.50	63.625
Platinum $/oz. Duty Free	108	108	108	108	.....	108	108	108	103-4	103-4	103-4	103-4	103-4

Date	20	21	22	23	24	27	28	29	30	High	Low	Avar.	Dec. 1
Copper (f. o. b., Ref.) c/lb. Duty Free:									Holiday				
Lake (Delivered)	14.125	14.125	14.125	14.125	14.125	14.125	14.125	14.125	.....	14.25	14.125	14.138	14.125
Electrolytic	13.875	13.875	13.875	13.875	13.875	13.875	13.75	13.75	.....	13.875	13.625	13.806	13.75
Casting	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	.....	13.40	13.40	13.40	13.40
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.:													
Prime Western	7.25	7.20	7.05	6.90	6.85	7.00	7.00	7.05	.....	7.30	6.85	7.131	7.10
Brass Special	7.35	7.30	7.15	7.00	6.95	7.10	7.10	7.15	.....	7.40	6.95	7.230	7.15
Tin (f. o. b. N. Y.) c/lb. Duty Free:													
Straits	36.75	36.625	36.375	36.00	36.00	36.75	36.50	36.00	.....	38.00	36.00	36.725	36.00
Pig—99%	36.00	35.875	35.375	35.375	35.375	35.375	35.125	35.00	.....	37.25	35.00	35.950	35.00
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.95	6.90	6.90	6.90	6.95	7.00	7.00	7.00	.....	7.00	6.55	6.906	7.00
Aluminum, c/lb. Duty 5c/lb.	22.50	22.50	22.50	22.50	22.50	22.50	22.50	23.00	.....	23.00	21.00	22.00	23.00
Nickel c/lb. Duty 3c/lb													
Ingot—Internat. Nick. Co.	36	36	36	36	36	36	36	36	.....	36	36	36	36
Outside Spot	32-34	32.34	32-34	32-34	32-34	32-34	32-34	32-34	.....	34	32	32-34	32-34
Electrolytic (Internat. Nick. Co.)—													
Ni—99.80 contam. impurities—.14.	39	39	39	39	39	39	39	39	.....	39	39	39	39
Brit.-American Nick. Corp.—													
Ni—98.50, contam. impurities—.80.	33	33	33	33	33	33	33	.....	.....	33	33	33	33
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.50	6.50	6.50	6.50	6.50	6.45	6.45	6.45	.....	6.60	6.45	6.548	6.45
Silver (foreign) c/oz. Duty Free	64.50	65.00	64.50	64.50	64.25	64.25	63.75	64.25	.....	67.75	63.50	65.156	64.75
Platinum $/oz. Duty Free	103-4	103-4	103-4	103-4	104-5	104-5	104-5	104-5	.....	108	103	105.28	104-5

Metal Prices, December 1, 1922

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	"	"	"	10 to12¼
Brass Ingots, Red	"	"	"	12¼to14
Bronze Ingot	"	"	"	13 to15¼
Bismuth				$2.65-2.75
Cadmium				1.15-1.25
Casting Aluminum Alloys	"	"	"	21 to24
Chromium Metal—95-98% Cr., per lb. Cr. contained, nom.				1.50
Cobalt—97% pure				3.00-3.25
Manganese Bronze Castings	"	"	"	21 to33
Manganese Bronze Ingots	"	"	"	12 to15½
Manganese Bronze Forgings	"	"	"	30 to40
Manganese Copper, 30%	"	"	"	28 to45
Manganese Metal—95-98% Mn., carbon free, per lb., nom.				0.75
Magnesium Metal				$1.25-1.50
Parsons Manganese Bronze Ingots	"	"	"	17½to19
Phosphor Bronze	"	"	"	24 to30
Phosphor Copper, guaranteed 15%	"	"	"	17 to23
Phosphor Copper, guaranteed 10%	"	"	"	16½to22
Phosphor Tin, guarantee 5%	"	"	"	43 to57
Phosphor Tin, no guarantee	"	"	"	41 to55
Quicksilver				$71.00-72.00
Silicon Copper, 10%	according to quantity			28 to35

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12½to12¾
11 to11½	Copper Wire	12¼to12½
10 to10¼	Light Copper	11 to11¼
8½to 9	Heavy Machine Comp	10 to10½
6¾to 7	Heavy Brass	8 to 8½
5½to 6	Light Brass	7 to 7¼
6¼to 6½	No. 1 Yellow Brass Turnings	7¼to 7½
7¾to 8½	No. 1 Comp. Turnings	9¼to10
4½to 4¾	Heavy Lead	5 to 5¼
4½	Zinc Scrap	4¾to 5
7 to 7½	Scrap Aluminum, Turnings	9 to10
12 to13	Scrap Aluminum, cast alloyed	14½to15½
15 to16	Scrap Aluminum, sheet (new)	17½to18½
18½	No. 1 Pewter	22½
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29

BRASS MATERIAL—MILL SHIPMENTS

In effect September 27, 1922

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18½	$0.20	$0.21½
Wire	0.19	0.20½	0.22
Rod	0.17	0.21	0.22½
Brazed tubing	0.25⅜	.....	0.30¼
Open seam tubing	0.25⅜	.....	0.30¼
Angles and channels	0.28⅜	.....	0.33¼

To customers who buy less than 5,000 lbs. in one order

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.19½	$0.21	$0.22½
Wire	0.20	0.21½	0.23
Rod	0.18	0.22	0.23½
Brazed tubing	0.26⅜	.....	0.31¼
Open seam tubing	0.26⅜	.....	0.31¼
Angles and channels	0.29⅜	.....	0.34¼

SEAMLESS TUBING

Brass, 23c. to 24c. per lb. base.

Copper, 24¾c. to 25¾c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20½c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18½c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	19½c. net base
Muntz or Yellow Metal Rod	16½c " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21½c.-22½c. net base
From stock	22½c.-23½c. net base

BARE COPPER WIRE—CARLOAD LOTS

16c. to 16¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	19¾c. per lb. base
100 lbs. to 200 lbs. in one order	20¼c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¼c. to 9½c. basis less 8 per cent. discount.

Casks, jobbers' prices	10c. to 10¾c.
Open casks, jobbers' prices	10¾c. to 11¾c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	36c.
Aluminum coils, 24 ga. and heavier, base price	33c.
Foreign	42c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	26¾c. per lb.
15%	"	28½c. " "
18%	"	29¼c. " "

Nickel Silver Wire and Rod

10%	"	29¾c. " "
15%	"	33¾c. " "
18%	"	36½c. " "

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	50
Hot Rolled Sheets (base)	45

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 67c. to 70c. per Troy ounce, depending upon quantity.

Rolled sterling silver 65c. to 68c.

NICKEL ANODES

85 to 87% purity	42½c. per lb.
90 to 92% purity	45c. per lb.
95 to 97% purity	47½c. per lb.

Supply Prices, December 1, 1922

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.21½-.25
Acid—		
Boric (Boracic) Crystals	lb.	.13
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg. Carboys	lb.	.02½
Alcohol—		
Butyl	lb	.18-23
Denatured in bbls.	gal.	.36
Alum—		
Lump, Barrels	lb.	.04½
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½-.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.50
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.14
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.09
Chrome Green	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.36
Carbonate, Barrels	lb.	.20
Cyanide	lb,	.52
Sulphate, Barrels	lb.	.06
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.00
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.75-1.00
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	1.05
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.27½-.40
Salts, single, bbls	lb.	.12
Salts, double, bbl	lb.	.11
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.25-.30
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.06½
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	lb.	.05
Cyanide, 165 lb. cases, 94-96%	lb.	.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.20
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.47
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Bisulphate, tech., bbls	lb.	.03½
Cyanide, 96 to 98%, 100 lbs	lb.	.25
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	lb.	.01¾
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.36
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.30
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.13-.17
Chloride, 600 lb. lots	lb.	.06½
Cyanide	lb.	.40
Sulphate, bbls.	lb.	.03

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	39.45
14 inch, 20 ply, 64/68, cloth	base,	49.05
12 inch, 20 ply, 84/92, cloth	base,	45.00
14 inch, 20 ply, 84/92, cloth	base,	60.60
12 inch, 20 ply, 88/96, cloth	base,	52.30
14 inch, 20 ply, 88/96, cloth	base,	70.45
Sewed Buffs, per lb., bleached and unbleached	base,	.50

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.60	2.35
" 6" 8" and over 16"	1" to 3"	2.70	2.45
" 6" to 24"	Over 3"	3.00	2.75
" 6" to 24"	½" to 1"	3.60	3.35
" 4" to 6"	¼" to 3"	4.60	Any quantity
" Under 4"	¼" to 3"	5.20	Any quantity

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.

Monarch Furnace Ads

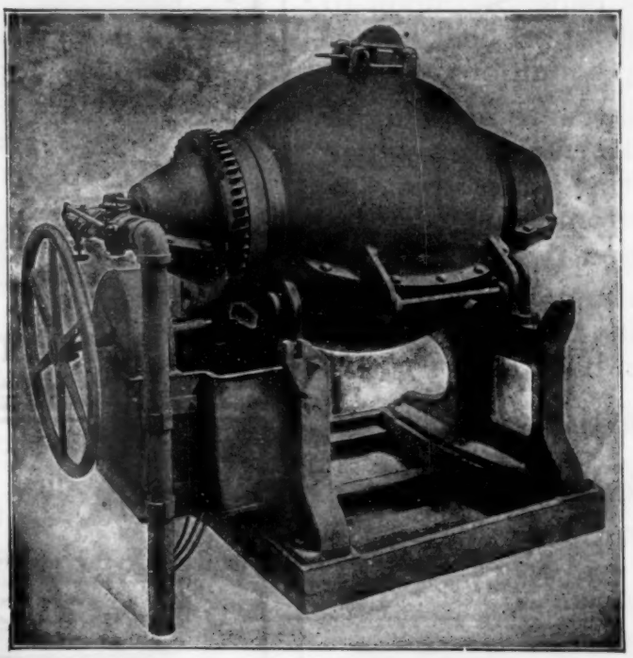
have been appearing here for 20 years and all the while

MONARCH FURNACES

have been faithfully serving the industry in the foundries throughout the land. Their cost-reducing features will continue during 1923 to add to the MONARCH reputation.

The Reason for this long-continued success — Monarch Furnaces have kept pace with modern development in foundry practice—they provide highest production at lowest installation cost, low overhead, low operating and maintenance costs.

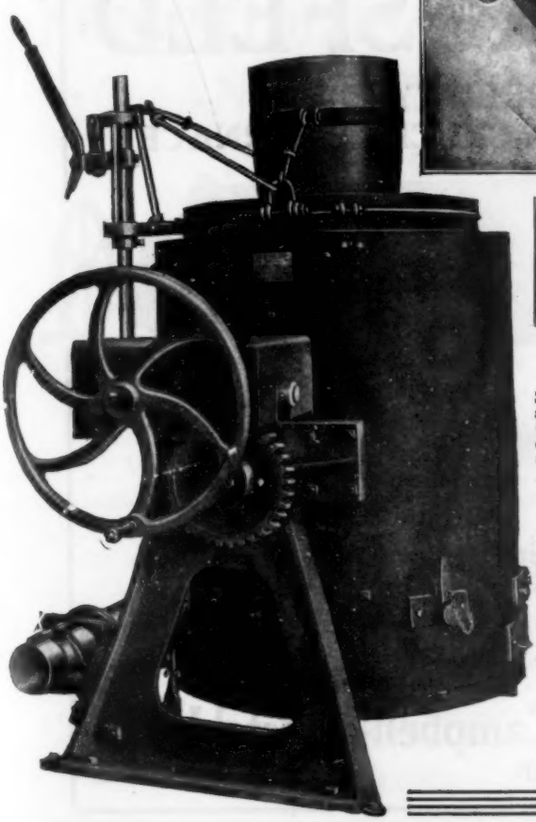
They excel in reliability and durability. They are the safest, soundest, most satisfactory plant investment you can make.



Monarch-Arundel and Acme Core Ovens.
All Fuels. All Sizes.

Monarch Continuous Revolving Non-Crucible Furnace.
The motor-driven continuous rotary motion gives longer life to the linings, decreases the melting period and saves labor.

Monarch Steele-Harvey Crucible Tilting Furnace. Oil or Gas.



Monarch Coke-Fired Tilting Crucible Melting Furnace
Made in several sizes. Has Hopper Fed and Shaker Grates. A most satisfactory furnace in every respect.

A Monarch Type for Every Metal Melting Need

Send for full particulars of those illustrated here and ask about MONARCH Simplex, Double Chamber and Tilting Reverberatory types without crucibles, and the complete MONARCH line of crucible furnaces, stationary and tilting.

We specialize exclusively in equipment for brass and iron foundries

A complete line of Oil Pumps, Blowers, Burners, Soft Metal Melting Furnaces, Barium Chloride, Cyanide Hardening, Tempering and Annealing Furnaces, etc.

Send for Catalog TF $\frac{12}{1921}$

The Monarch Engineering & Manufacturing Co.

1206 American Bldg., Baltimore, Md., U. S. A.
SHOPS AT CURTIS BAY, MD.
NEW YORK OFFICE: 50 CHURCH ST.

DIXON GRAPHITE CRUCIBLES

are uniform in composition, construction and performance.

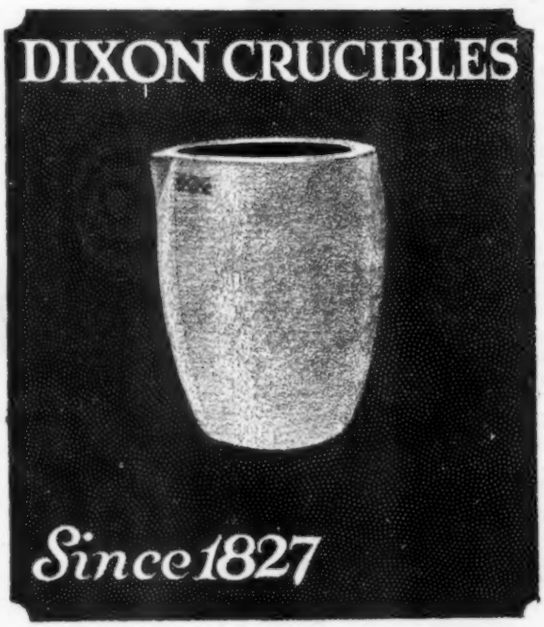
They can be depended upon to withstand heat after heat under the most trying conditions.

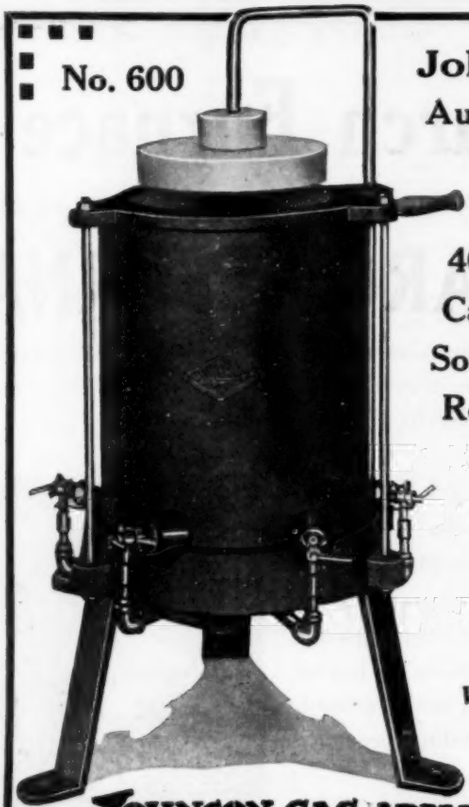
Dixon Crucibles are made in all shapes and sizes from the regular types for melting brass, etc., to Reservoir, Bottom-Pour, Tilting Furnace and other types.

Each form is standard in its line and is made with nearly a century of experience in back of it.

Write for Booklet No. 12-A

Joseph Dixon Crucible Company
Jersey City, N. J.
ESTABLISHED 1827





No. 600

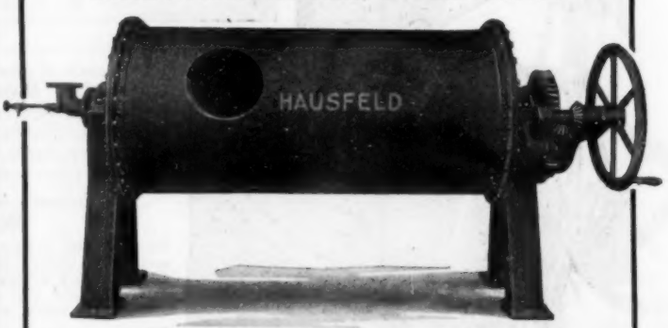
Johnson Auto-Blast Gas Furnace
400 lbs. Capacity
Soft Metal
Requires No Forced Air Blast

Write for Catalog

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

HAUSFELD

BARREL TYPE NON-CRUCIBLE FURNACE



Built in 2000 and 1000 pound capacity per heat, gas or oil fuel. Let us tell you about the performance of this furnace.

Manufactured Only by

The Campbell-Hausfeld Co.
HARRISON OHIO

Fresh Air

Any foundry can have fresh air—even a brass foundry. Not even a fan is necessary.

All that's needed is right design and sash that really ventilates. This booklet tells how you can get both. It's free on your request.

DAVID LUPTON'S SONS COMPANY

Agate St. and Allegheny Ave.
Philadelphia, Pa.

To-day—the sash makes the foundry

NON-OXIDIZING ANNEALING FURNACES

FOR THE BRIGHT ANNEALING
OF NON-FERROUS METALS
AND HEATED BY
OIL, GAS OR ELECTRICITY

CHARLES F. KENWORTHY, Inc.
WATERBURY, CONN.

For Furnace Insulation See Page 27

SEND in the coupon at the bottom of this column and you will receive, free of charge, the 72-page book, "Nonpareil Insulating Brick."

Read the first 18 pages for a general explanation of insulation and then turn to page 27, the section on furnace insulation. There is something specific—the economies of insulation in your own industry. Losses are calculated from actual operation data. Specifications and diagrams show exactly how Nonpareil Brick are built into furnace construction. And the saving is demonstrated in figures that convince because they deal with familiar conditions.

Are you an operator, designer or builder of furnaces, ovens or boilers? You will appreciate this book. Fill out and mail the coupon.

Armstrong Cork & Insulation Company
116 Twenty-fourth Street Pittsburgh, Pa.

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Please send me, free of charge, a copy of "Nonpareil Insulating Brick" and a sample brick.

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VICTORY CRUCIBLES

Endorsed by the number and standing of the concerns which use them; by their constantly increasing volume of sales, and by their consistent record for reducing metal melting costs wherever they are adopted as standard.

Causes:

(*a*) Uniformly high grade materials (*including the best Foliated Ceylon Graphite*);
(*b*) Careful supervision of every step in production and rigid adherence to the LAWTON PROCESS by which they are produced;
(*c*) Molding, burning and final inspection by experienced specialists;
(*d*) Long period of seasoning before being placed in stock.

Results:

(*a*) Higher and more uniform average number of heats;
(*b*) Exact duplication on reorders;
(*c*) The stabilization of foundry costs and a more certain margin for profits.

No wonder they use them.
Try them on your next order.

Jonathan Bartley Crucible Company
TRENTON, NEW JERSEY, U. S. A.

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OVER 60 YEARS
J. H. GAUTIER & CO.
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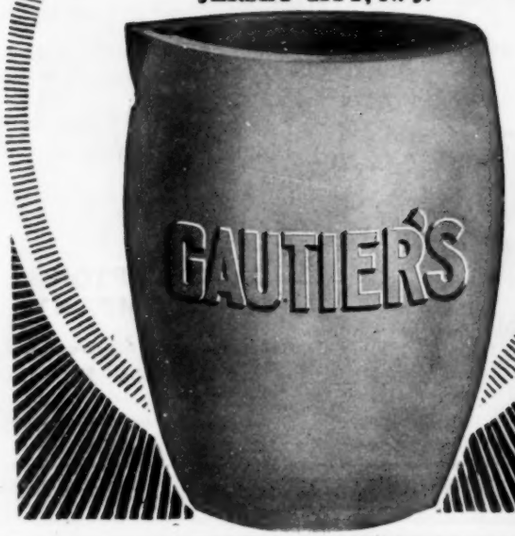

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Tycos
temperature instruments

Executives in the metal industries have solved many of their Temperature problems by installing *Tycos* Temperature Instruments.
May we assist you in solving your problems that involve temperature. Mention your firm connection when writing for our catalog.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.
There's a *Tycos* and *Taylor* temperature instrument for every purpose AM

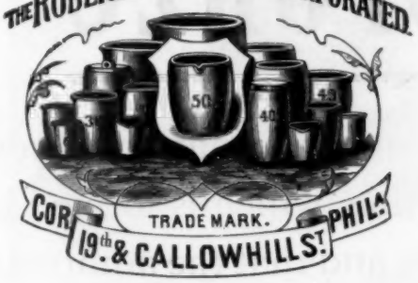
Furnace Linings

Ramming in Lining

for all types of non-ferrous melting furnaces. No need for special, carefully fitted shapes.
You just use a plastic mixture of **CARBOSAND and HYTEMPITE** (following carefully our instructions for mixing) and ram it into place between furnace shell and collapsible form of wood or metal.

Ask for Folder CM

Quigley Furnace Specialties Co., Inc.
26 Cortland St. New York
Hytempite is carried in stock by our agents from Coast to Coast



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1900 to 1916 Callowhill St., PHILADELPHIA, PA.

Above the Standard

Let us send you a trial lot and prove it.

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CRUCIBLES
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SALES OFFICE
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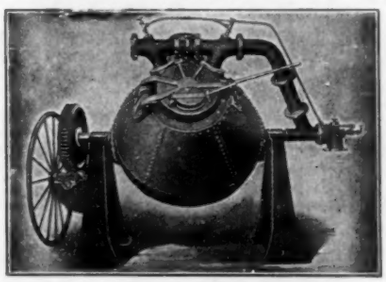
The One Real Solution of Your Melting Problems

THE

HAWLEY-SCHWARTZ FURNACE

Enemy of High Cost Melting!

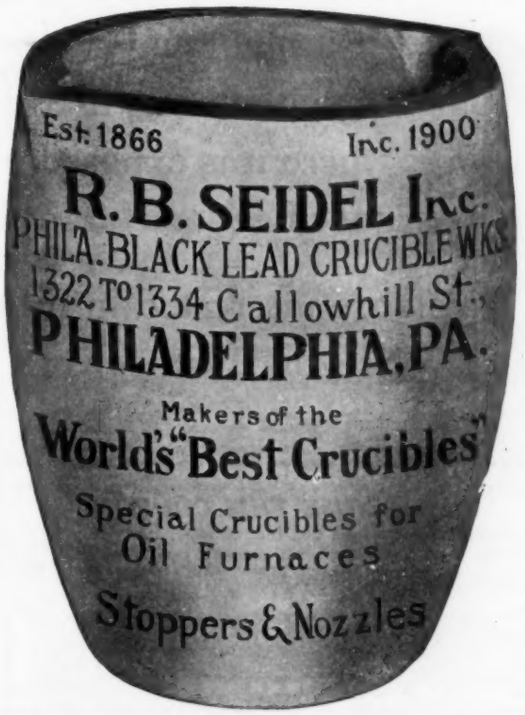


Investigate the Hawley-Schwartz before ordering high-cost electric installations. It eliminates crucibles and crucible troubles — prevents volatilization losses — melts more metal with less men.

CATALOG M-1 SENT ON REQUEST

HAWLEY-DOWN DRAFT FURNACE CO.

EASTON, PA.



Phosphor Bronze

It has long been known that Bronze frequently contains a considerable quantity of cuprous oxide in solution, which is formed by direct oxidization of the copper during fusion, and that the admixture of this oxide impairs to a great extent the strength of the Alloy.

If now the melted bronze be treated with a substance exerting a powerful reducing action, as for instance, BORONIC COPPER NO. 9 "L," a complete reduction of the Cuprous Oxide takes place, the pure bronze acquiring thereby a surprisingly high degree of strength and power of resistance. The addition of this alloy to Bronze will increase the tensile strength enormously, raise the limit of Elasticity and will increase the power of resisting repeated stresses.

Phosphor Bronze of suitable composition can be rolled and drawn cold, forged, and cast. It is more resistant to corrosion than most alloys, therefore is used largely for propeller blades and other purposes where it is exposed to sea water. It is so tough and strong that most specifications for high grade gears call for Phosphor Bronze.

If you are interested in producing a high grade Phosphor Bronze Phone, Wire, or Write for our literature which is free for the asking.

To the Metal Manufacturer or the Individual Mixer of Metals:

PLEASE USE THIS COUPON!

American Boron Products Co., Inc., Reading, Pa.

Gentlemen:—Please send me complete details regarding the many ways whereby I can economize by using BORONIC ALLOYING METALS. My Address is:

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Our literature mailed to employer and employees who aim for IMPROVED PRODUCTS

American
Boron Products Company, Inc.
SOLE MANUFACTURERS
Reading, Penna., U. S. A.

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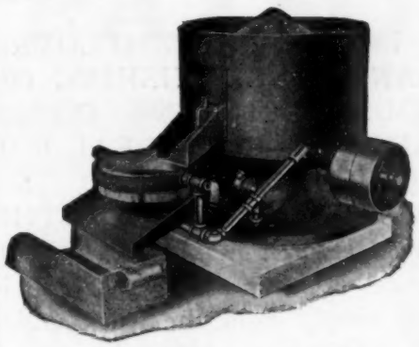
CORE ROOM EQUIPMENT

Core Making Machines for round stock bushing cores, absolutely accurate, any size, from 3/8" to 7" in 64ths if needed.



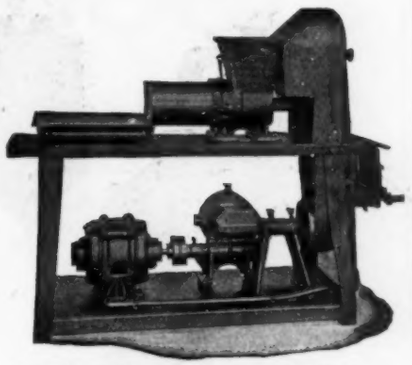
The Wadsworth Compounding Mill

3 FT. SAND MIXING AND COMPOUNDING MILL

Get full benefits of all compounds and binders by using this mill in mixing your core sands, 5 or 6 tons per day.

Write for our catalogue

Wadsworth Core Cutting-off and Coning Machine



The Wadsworth Navy Type, Motor Driven, Core Making Machine, ⅝ to 7 in.

CORE CUTTING OFF AND CONING MACHINE

For cutting cores to length after they are baked and tapering or coning either or both ends for the core print.

Manufacturers of steel bottom and core plate.

THE WADSWORTH CORE MACHINE & EQUIPMENT CO.

AKRON OHIO

WE IMPORT ALL OUR PLUMBAGO DIRECT. We demand and we get only the best. Our crucibles win customers because they are the very best made; they save money for those who use them. Write for prices.

McCullough - Dalzell Crucible Co.

PITTSBURGH, PA.

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U.S

Sizes ½ inch up

ARE THE BEST

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For Phosphor-Bronze Copper, Tin, Etc.

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EFFICIENT Gas - INDUSTRIAL - Oil FURNACES

Uniform Temperature Maximum Output

Minimum Fuel Cost

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364 Gerard Ave., Bronx, New York, N. Y.

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SANDBLASTING IS WIDELY EMPLOYED FOR FROSTING AND MAT FINISHING ON CELLULOID GOODS, INCLUDING COMBS AND HAIR ORNAMENTS—IT IS IDEAL FOR THE PURPOSE—QUICK, CLEAN AND UNIFORM—SANDBLASTING, HOWEVER, IS THE PROCESS—THE MACHINE YOU USE IS OF great importance—Leiman Bros. machine is automatic—you simply hold the work under the nozzle—like filling a glass with water under a faucet—the sand feeds continuously without interruption—as long as you wish—the work is confined inside the cabinet—no dust—no annoyance—and any boy or girl gets the most satisfactory results on the first try.

Catalog J-SB

LEIMAN BROS.

81 WALKER STREET
NEW YORK

Makers of Good Machinery for 35 Years

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One of our customers recently cleaned 2500 lbs. of heavy Bronze Castings, some cored, averaging from 40 to 60 lbs. each, in our No. 3, 36" x 44" "Radial Blast" Barrel, in 20 minutes, using 70 lbs. pressure. This is only one sample of the speed of our "Radial Blast" Barrels.

Four sizes, 24" to 60" diam.

Our Revised Bulletin "SRB" Will Give You Full Particulars.

THE STANDARD EQUIPMENT CO., New Haven, Conn.

For Better Finished Castings

Use
NEW HAVEN
SANDBLAST
EQUIPMENT

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New Haven, Conn.

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Send your inquiries on special designs.

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TUMBLING BARRELS
SAND BLAST
DUST COLLECTORS
MAGNETIC SEPARATORS
CORE MACHINES
DRYING STOVES
BAND SAWS
ASHES GRINDERS

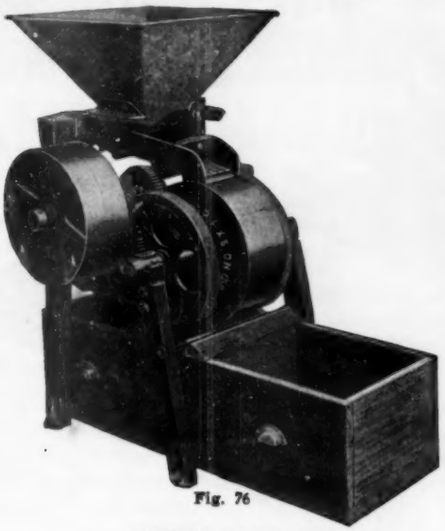

Fig. 76

SUPPLIES

TONGS AND SHANKS
FLASKS AND CLAMPS
SPILL TROUGHS
INGOT MOLDS
RIDDLES, BELLOWS
SHOVELS, BRUSHES
MOLDING SANDS
CORE SANDS
PAXSON'S PARTING
FACINGS, CHARCOAL
CORE COMPOUND
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WE MAKE IT
PAXSON MAGNETIC SEPARATOR

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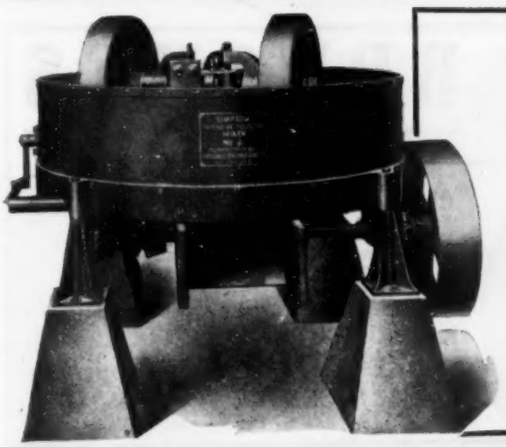
BALTIMORE, MD.



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THE PRODUCT OF A PRACTICAL FOUNDRYMAN

For Brass, Bronze and Aluminum Foundries
Also Gray and Malleable Iron and Steel

Thoroughly mixes and blends all foundry sand mixtures. Saves the old sand and binder. Economical, efficient, an aid to better quality and lower production costs.

Made in 4 sizes, 3 to 8 feet diameter pans.

National Engineering Company
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SAND-BLASTS
DUST ARRESTERS

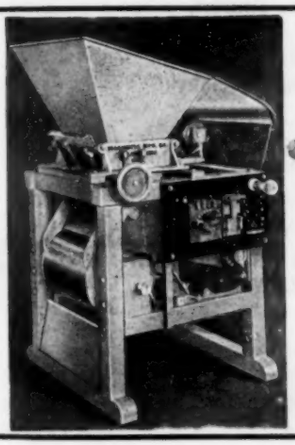
TYPE AND SIZE FOR EVERY REQUIREMENT

World's Largest Manufacturers

P. O. Box 854

SAWDUST FOR POLISHING AND PLATING BRASS BRONZE COPPER ALUMINUM METAL GOODS

NATIONAL SAWDUST CO.
MANUFACTURERS OF
DUSTLESS HARWOOD SAWDUST
Any Kind, Size or Color
Prices and Samples on Request
108 North First St. Brooklyn, N. Y.



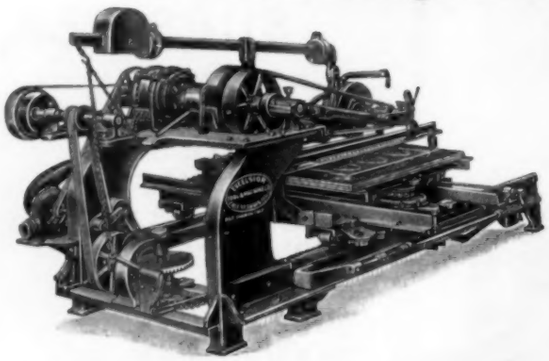
TYPE "L" MAGNETIC SEPARATOR

Removes every trace, 100% of iron and steel from brass chips, etc.

Best design, largest capacity.

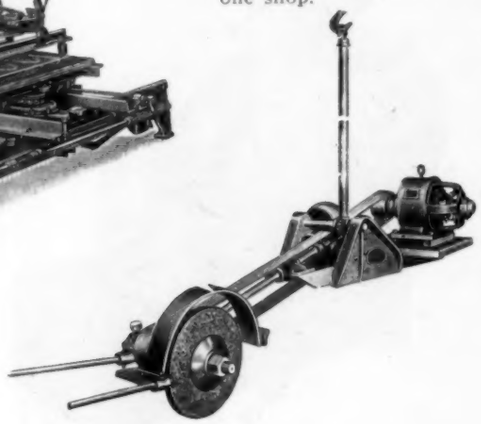
MAGNETIC MFG. CO.
755 Fourth Ave., Milwaukee, Wis.

Three Modern Production Machines Installed in the Largest Up-to-Date Plants



No. 27 Automatic Surface Grinding and Polishing Machine. Sixteen in use in one shop. Used in England, France, Belgium, Canada and the U. S.

No. 8 Swing Grinder, made in 3 styles and 4 sizes. Nine in one shop.



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Send for our literature and prices.

We can convince you our machines are real production machines that will eliminate trouble.

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31st STREET and RIDGE AVE. **EAST ST. LOUIS, ILL.**

Established 1882

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Platers' and Silversmiths' Brushes Our Specialty

Special Brushes Made to Order

SATIN FINISH WIRE TUFTS IN ALL GAUGES OF BRASS OR STEEL WIRE

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Brass, Copper and Steel Wire Brushes

An assortment of

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Repairs Promptly Attended to.

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ANDREW H. LAU, Sole Proprietor
241-243-245 CENTRE ST., NEW YORK
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Economy ADJUSTABLE HOODS

Operate with much less suction—more quickly adjusted and never in way of operator—

SAVE POWER and TIME

State height of spindle from floor and size of largest wheel used. We'll send one "on trial." If not satisfactory—return at our expense.

We design and install Complete Dust Collecting Systems—can rid your polishing and buffing department of dust. Send for our catalog.

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Pneumatic Engineers

High Grade Dust Collecting Systems

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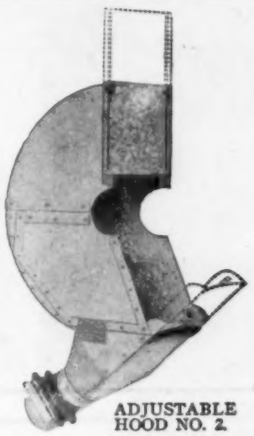


ADJUSTABLE HOOD NO. 2.

IMPROVED STANDARD HOOD

CLEVELAND Blow Pipe EFFICIENCY in Metal Working Plants

DUST COLLECTING SYSTEMS

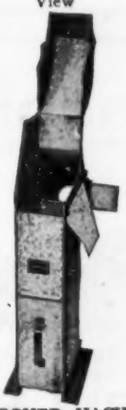
CLEVELAND Blow Pipe Experience, extends over a period of 25 years during which time it has touched every branch of this work.

The company is composed of engineers who are competent to study the peculiarities of special problems, no matter how complicated or difficult, and design systems that will adequately meet the needs and quickly pay for themselves.

Cleveland Blow Pipe & Mfg. Co.
Cleveland, Ohio

Closed View

Open View



IMPROVED VACUUM HOOD

Cloth Screen Dust Arrester (Below)

Humane Rotary Table Room

Pressure Barrel

Don't go by the pictures alone!

These sand blast machines were built for others. Your job may require something very different.

We build all successful forms of sand blast and shot blast equipment. Our recommendations are made advisedly according to the job and conditions to be met.

The American Foundry Equipment Co.
500 Marlin-Rockwell Bldg., New York

Boston	Philadelphia	York	Pittsburgh
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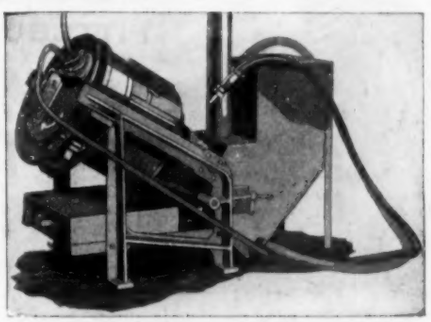
The UNIVERSAL SLYBLAST Mill

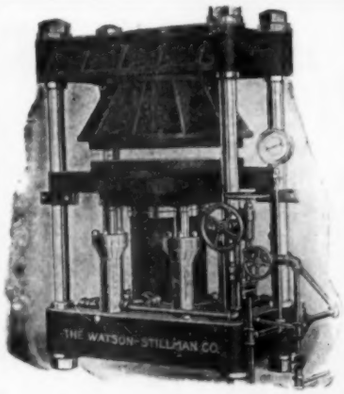


UNIVERSAL *Because—*

it will clean small work in quantities—automatically.
It will clean large pieces with the hand nozzle.
It will blast quickly and economically.
Brass, Bronze, Aluminum and Iron Castings, Forgings and Stampings, Twist Drills, Reamers and other Tools, Builders' Hardware, etc.

Give it a trial.

THE W. W. SLY MFG. CO.
CLEVELAND, OHIO
OFFICES IN ALL PRINCIPAL CITIES



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For

DIE SINKING, PRESSING, EMBOSSING, SHEET METAL FORMING, DRAWING, CUPPING, FLANGING, BENDING AND EXTRUDING

Two of these presses are shown here. One at the right is a 1000 ton standard die press, designed to be used with an independent pump or accumulator system. The other is a press arranged to draw automobile rims from sheet metal. Our line of presses contains many machines built for the working of metals. We build everything necessary to equip complete hydraulic plants—pipe, valves, pumps, accumulators, packing, etc.

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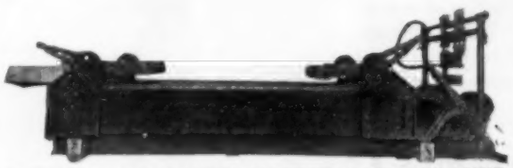
The Watson-Stillman Company

W-S HYDRAULIC **196 Fulton St., New York** W-S HYDRAULIC

Chicago, McCormick Building 359

Machinery for BRASS STRIP



SUNDH STRIP CLEANING MACHINE, PICKLING UNIT

Slitting Machines
Coilers
Blockers
Bar Straighteners
Flatteners
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Etc.

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A. GARRISON FOUNDRY CO.

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400 Ton Press with **Garrison Dwell Motion**

Patented

"PECK"

Automatic Drop Lifters

will convert those hand or foot drops and unsatisfactory automatics into

Productive Automatic Drops

Capacity 15 to 5,000 pounds

DROP PRESSES FOR ALL PURPOSES

MINER & PECK MFG. CO.
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One of the quickest methods of raising your profits is to instal a few Type D ELECTRIC

NORTHERN HOISTS

NORTHERN ENGINEERING WORKS.
DETROIT, MICH. U.S.A.

(Makers of Northern Cranes)

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Efficiency

BLISS

To BE PROFITABLE the manufacture of small stampings made in large quantities must be extremely rapid with practically no loss due to rejections.

In the picture we show a BLISS No. 19½ Inclinable Power Press the production of which is 45,000 blanks a day. The operator and the character of the work are each factors in the production rate as well as the efficiency of the press. With BLISS Presses you are assured of the latter. Over one hundred BLISS Presses are operating in the plant where this photograph was taken.

BLISS on your machinery is more than a name, it's a guarantee.

Bliss for Machinery

E. W. BLISS CO. MAIN OFFICE AND WORKS **BROOKLYN, N. Y., U. S. A.**

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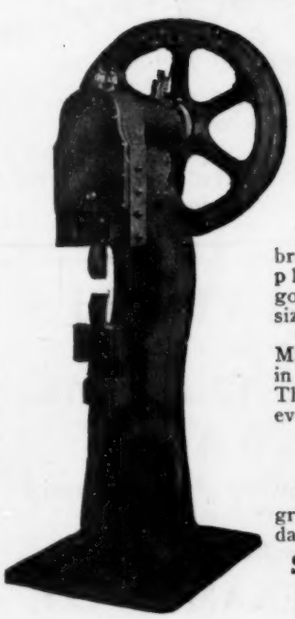
No. 313

TURNER MACHINE CO.

3633 North Lawrence Street

PHILADELPHIA, PA.



TURNER PATENT SPRUE CUTTER
WITH BELT DRIVE

Strong, rigid, durable; large capacity, good adjustment, good frame.

TURNER PNEUMATIC MOLDING MACHINE

Designed especially for brass foundries making plumbers' and electrical goods, etc. Built in three sizes.

Our Hand Power Molding Machines are highly regarded in numerous large foundries. This new pneumatic type is even better.

AUTOMATIC COCK GRINDER

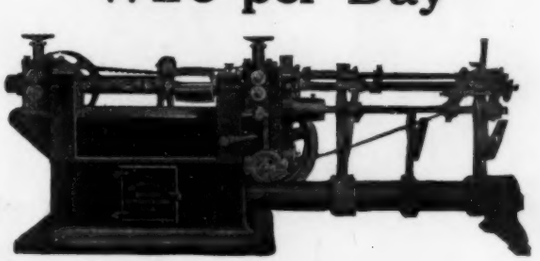
With one operator will grind 400 ¾-inch cocks per day.

SAND SIFTER AND MIXER

Made with single or double heads. Requires only ½ horsepower. Soon pays for itself.

Send for Catalog M2

Over Ten Miles of Wire per Day



One manufacturer straightens and cuts to accurate lengths over ten miles of wire per day on our *Automatic Wire Straightening and Cutting Machine.*

You can readily perceive that such speedy operation will soon pay for our machine.

This is just a habit with the *Shuster,* however, and it has been keeping it up for years.

Catalog tells why.

THE F. B. SHUSTER CO.

NEW HAVEN, CONN.

Formerly John Adt & Son

ESTABLISHED 1866

Also makers of Riveting Machines

No. 86 Ball Bearing Polishing and Buffing Lathe

May be Belted from any Angle *Belt Shifter Always in Position*
Operator Protected from Belt at all times

BELTED BACK

SPECIFICATIONS

Length of spindle overall	48″
Diameter of spindle between bearings	2″
Diameter of spindle in bearings	1.77″
Diameter of spindle between flanges	1¼″
Bearings—2 row S K F	No. 1309
Distance between wheels	36″
Diameter of flanges	6″
Tight pulley—6″ dia. x 4½″ face	
Loose pulley—5¾″ dia. x 4¼″ face	
Maximum wheel, thickness	4″
Height to centerline of spindle	38″
Size of base at floor	20″ x 24″
Net weight in lbs.	550
Shipping weight in lbs.	650

CONNECTICUT DYNAMO AND MOTOR COMPANY

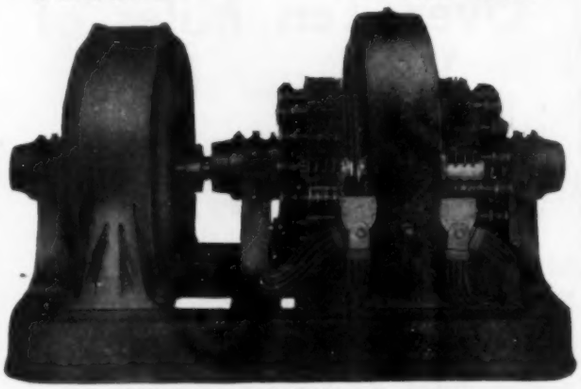
200 LYONS AVE., IRVINGTON, NEW JERSEY

MANUFACTURERS OF

THE IMPROVED AMERICAN GIANT DYNAMO - - THE ROTOPLATER

The Eager Electric Company

Watertown New York



6,000 Ampere, 6 Volt Motor-Generator

Manufacturers of low voltage

ELECTRO GENERATORS and MOTOR GENERATORS

for Electro Galvanizing, Electro Plating and all purposes for which low voltage generators are used. We furnish synchronous motors with our large generators. These motors operate with 100% power factor and assist in building up the general power factor in the plant.

CONSULT US WHEN YOU ARE IN NEED

of modern machinery for deposition of metals. We have specialized in this line of machinery for the last twenty years and have installed plants ranging in capacity up to 100,000 amperes. Send for Catalog M.

Electro-Plating Generators

From 175 to 8,000 ampere capacity

Maintaining

CONSTANT VOLTAGE

with all changes of load.

Voltage adjustable from 2 to 8 volts—larger sizes from 4 to 12 volts.

Jantz & Leist Electric Company
Cincinnati, Ohio

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MADE OF

ACID-PROOF CHEMICAL STONEWARE

resist the deteriorating action of all commercial acids and corrosive compounds.

Write Dept. B for full particulars.

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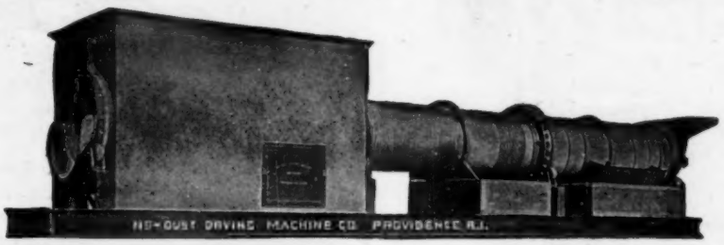
50 Church St. New York City

A Continuous Process Machine for Cleansing and Drying



Washes thoroughly each individual piece inside and out—washes them better than they can be washed by any other method and in less time. Washes shells and cups as easily and quickly as flat pieces and each article will be uniformly cleansed.

Machines may be had for one or more solutions wash, with a clean water rinse after each solution wash. Delivery is from one bushel up per minute, regardless of number of operations. One man operating this machine will do as much work as eight or more can do by dipping or hand methods. One installation with a pickling section showed saving in labor of twenty-four men. Any one of the machines will pay for itself in three or four months. Figure it up yourself, at a bushel a minute, and see how many men you could save. All solutions drain back to tank—you lose only what adheres to the surface.

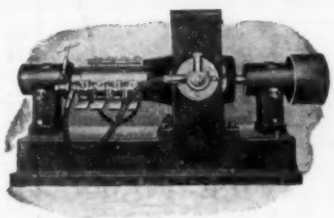
We build the machine to meet your requirements; when you answer this ad tell us operations desired, nature and sizes of your work and quantity in bulk per hour or day.

Automatic machines for pickling, cleansing, drying, burnishing.

NO-DUST DRYING MACHINE CO.

Dorrance and Friendship Streets **Providence, R. I., U. S. A.**

DYNAMOS



For Electroplating, Electrotyping and Electro - Galvanizing in single, two and three voltages 60 to 10,000 Amperes 3 to 30 volts Shunt, compound and separately excited.

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Cable Address "MACHELECT" 'Phone, 581 Chelsea

99.9% PURE MAGNESIUM

Sticks Cubes Powder Ribbons Wire Turnings

Erftwerk **Min. 99.7% C. D.**

ALUMINUM **CADMIUM**

AMALGAMATED METALS SELLING CO., LTD.

42 BROADWAY NEW YORK CITY

Mg 99% Pure Metallic Magnesium

THE NORTON LABORATORIES

41st St. and Madison Ave., N. Y., Lockport, N. Y., Nashua, N. H.
British Thermit Co., Ltd., 49 and 51 The Albany, Liverpool, England
Authorized Representative in British Isles

The Quick and Easy Way to clean Metal Parts

is with GLOBE Tumbling Barrels. All types and kinds of metal parts are cleaned of dirt, burrs and flash in thousands of plants by this method.

The work is handled quickly, efficiently and economically; cleaning and polishing hundreds and thousands of metal parts at a time.

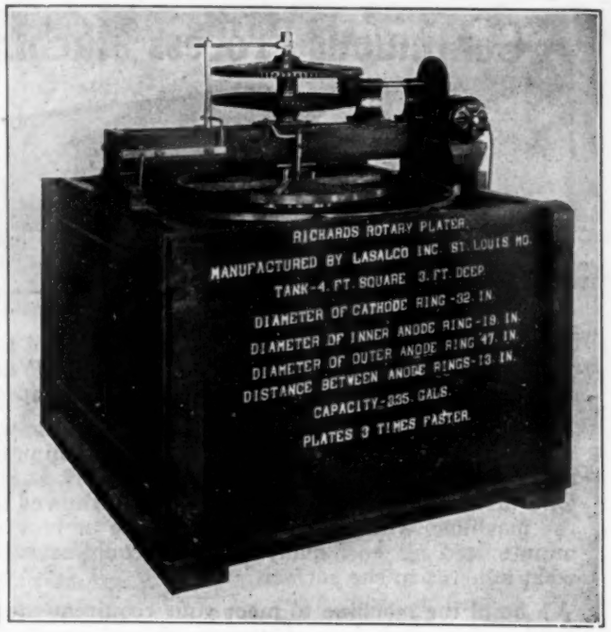
You can use GLOBE Tumbling Barrels in your work. Let us tell you how.

The Globe Machine & Stamping Co.

1259 W. 76th Street

Cleveland, **Ohio**

RICHARDS ROTARY PLATER
MANUFACTURED BY LASALCO INC.
ST LOUIS MO.
TANK-4 FT. WIDE 3 FT. DEEP
DIAMETER OF CATHODE RING-32 IN.
INNER ANODE RING 19 IN.
OUTER ANODE RING 47 IN.
DISTANCE BETWEEN ANODE RINGS-13 IN.
CAPACITY--300 GALS.
PLATES 3 TIMES FASTER.


RICHARDS ROTARY PLATER
MANUFACTURED BY LASALCO INC. ST. LOUIS MO.
TANK-4 FT. SQUARE 3 FT. DEEP
DIAMETER OF CATHODE RING-32 IN.
DIAMETER OF INNER ANODE RING-19 IN.
DIAMETER OF OUTER ANODE RING 47 IN.
DISTANCE BETWEEN ANODE RINGS-13 IN.
CAPACITY-335 GALS.
PLATES 3 TIMES FASTER.

MR. MANUFACTURER:

The Richards Rotary Plater, plates three days' work in one day, three hours' work in one hour, plates every piece uniformly and three times faster. Write for Bulletin 102.

Yours truly,

Everything for Polishing and Plating **LASALCO., Inc., Mfrs., 2828-38 La Salle St., St. Louis, Mo.**

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QUICK DELIVERIES

RIVETS
ESCUTCHEON PINS
SPECIAL WIRE NAILS
IN ALL METALS

The Highest in Quality
does not necessarily mean the **Highest** in **Price.**

Our Products prove that.

E. Reed Burns Mfg. Corp.

Makers of Fine Compositions and Buffs
Main Office: Brooklyn, N. Y.
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"PLATERS"
Protect your hands and arms from cyanide sores.
I-HEAL-U
will give instant relief and follows with a speedy cure. A supply of this great remedy should be in every plating room. 8 oz. bottle, $1.00.
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THE METAL INDUSTRY FOR 1918, 1919, 1920 AND 1921
PRICE, $3.00 each. Send for Special Offer.
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Imperial Patented Multiple Compartment Machines

No. 12
Pat. Sept. 17, 1912

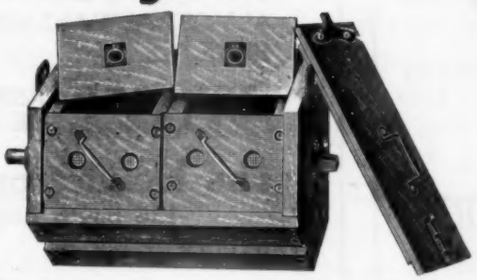
Made in sizes from two to six compartments. Unequalled for the manufacturer who wishes to polish a number of different kinds of small parts at one time and keep each kind separate.

We make seven stock sizes of this machine and can build them in special sizes if wanted.

Send for Catalog M-1

No. 4
Pat. Sept.
17, 1912

We also build several sizes of single compartment machines and carry a complete stock of steel balls, cones, spickets and soap powder for burnishing purposes. We solicit articles for free demonstration.



SMITH RICHARDSON CO.
ATTLEBORO, MASS.

ABBOTT BURNISHING BARRELS and BALLS

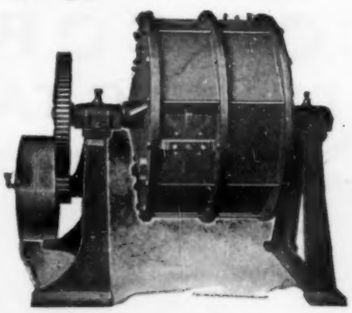
This combination never fails to put a beautiful finish on most small metal parts. Both before and after plating.

Any kind of steel balls will not do good work. Insist on Abbott Burnishing Balls. They are made specially for the purpose.

The border is symbolical of what we manufacture

STEEL BALLS—BURNISHING CONES—BURNISHING OATS

DEMONSTRATIONS CONDUCTED. SHIPMENTS FROM STOCK.



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Originators of Commercial Ball Burnishing

Abbott Street **Elmwood District** **HARTFORD, CONN.**

Blower

Polishing Bench

Ventilator

Rubbing

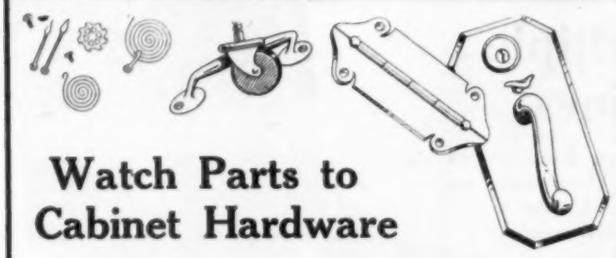
Drying

Sand Blast

THE BOLAND SYSTEMS

FOR FACTORY INSTALLATIONS
Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE & CO. (Send for Catalogues) 118 Orange Street, Providence, Rhode Island



Watch Parts to Cabinet Hardware

—dried in quantity in from one to seven minutes with the

TOLHURST
(Registered U. S. Patent Office)
CENTRIFUGAL METAL DRYER

WITHOUT TARNISH OR OXIDATION

The process results in smooth finish and lustrous appearance.

The TOLHURST is simple to operate—easy to load and unload.

Descriptive pamphlet gladly furnished on request.

TOLHURST MACHINE WORKS
TROY, N. Y.

OPERATING and UPKEEP EXPENSE

on different makes of

TUMBLING BARRELS

may vary as much as 25%

ACTUAL EXPERIENCE HAS SHOWN THAT IN MANY SHOPS THAT USE SEVERAL MAKES OF TUMBLING BARRELS THAT IN TIMES WHEN ONLY ONE OR TWO BARRELS ARE NEEDED OR IN CASES WHERE THE WORK MUST RUN FOR SEVERAL DAYS, HENDERSON BARRELS ARE ALMOST ALWAYS USED IN PREFERENCE.

WHY? ASK ANY USER HE KNOWS

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ESTABLISHED 1865

CORCORAN PLATING TANKS

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ESTABLISHED 1865

Tanks Any Size or Shape, for Any Purpose
Plain or Lined

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Any
Sizes or Shape
Prompt Shipment.
Send Us Your Specifications
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KALAMAZOO TANKS
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THE PASSAIC
CARPENTER and MILLWRIGHT SHOP
PLATING TANKS A SPECIALTY

TANKS and VATS

PASSAIC Corner Canal and Pacific Sts. NEW JERSEY

Baird Tumblers For All Purposes

Single Oblique Cast Barrel

ALL TYPES OF MACHINES—oblique tilting, horizontal, exhaust, non-exhaust, single, double, four-barrel, steam drying, japanning, ball burnishing.

EVERY TYPE OF BARREL—cast brass, cast iron, sheet brass, sheet iron, sheet copper, wood, cast iron with wood lining, wood barrel with metal lining, wood barrel with metal bottom or any other variation or combination of material. Barrels may be round, octagonal, four or eight sided, long or short, wide or narrow. They may be smooth inside or fitted with fins, or steps, or any one of many arrangements to effect the movement of work inside the barrel. There may be covers, or sieves, or divisions, special methods of heating or cooling or applying water, loading or unloading.

Japanning Barrel

DESCRIPTIONS OF VARIOUS TYPES OF TUMBLERS ARE GIVEN IN BULLETINS 300, 301, 302, 303 AND 309. THEY WILL BE SENT ON REQUEST.

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The Baird Machine Company

Bridgeport **Connecticut**

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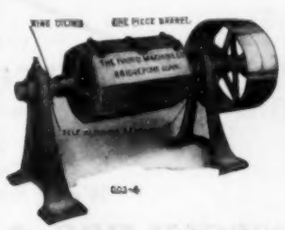
ZAVAS-ABREU COMMERCIAL CO.	HAVANA, CUBA

Steam Drying Barrel

Ball Burnishing Barrel



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Boston Tumble Barrel Plating Works

Specialty of Tumbling Barrel Plating
in Nickel, Brass, Copper, Galvanizing

Orders Promptly Attended To.

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Trade Mark

Our Booklet on MODERN POLISHING will interest you.

Your Polishing Department Needs

LIONITE

THE IDEAL ABRASIVE

A large Cutlery Manufacturer writes:—

"We wish to advise that we are using Lionite in all our polishing operations. We find that the material is giving absolute satisfaction and we have not used any other abrasive for two years."
(Name given on application.)

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"MATCHLESS" CELLULOID COMPOSITION

The best composition on the market for putting final lustre on

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Celluloid handles, toilet articles, combs, hair ornaments, etc.

Write for sample.

THE MATCHLESS METAL POLISH CO.,

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JOB PLATING

Largest Facilities in New York City

Established 1889

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CARBONATE NITRATE
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Pure Salts in the Bath
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NICKEL SALTS ARE PURE

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Established Connecticut concern desires to represent a manufacturer of platers' supplies, chemicals or some line sold direct to manufacturing companies. Address:

Representation

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POLISHING GRAIN

Borolon Polishing Grain (Electric Corundum) is the product of our own electric furnaces. As Manufacturers we control uniformity of grain which assures satisfaction to the user. All regular grain numbers supplied in eight different sized containers. Write for samples and prices of the numbers you regularly use.

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To Give Satisfaction.
It is the best Flux made.

It soders aluminum.
It soders any metal to any other metal.

It has greater tensile strength than any other.
It is non-acid, non-corrosive.

It comes in five forms.
Stick, paste, salts, oil, liquid.

Send for a Sample.

L. B. ALLEN CO. INC.
SODERING SUPPLIES

4542 North Lincoln Street
CHICAGO ILLINOIS

"SILVERGLOS"

NICKEL ANODES

90/92% 95/97%

All Shapes — All Sizes.

are made of new pure Virgin Nickel. They are bright solid castings, not the spongy blow hole type. Percentages guaranteed. They deposit a clean bright nickel surface which buffs with the greatest ease. This finish closely resembles silver. Hence their name "SILVERGLOS."

"Better Quality for Less Cost"

Our quotations will interest you.

Manufactured and sold by

Metal Finishers Supply Co., Inc.

491 Broome Street New York, N. Y.

Standard Chemicals

FOR

METAL and PLATING TRADES

NICKEL ANODES
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(Single and Double)
ACIDS — ALKALIES — SALTS
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Solvay Process Co.
Caustic Soda — Soda Ash

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Increased facilities permit us to take new business on

"JIM DANDY" BUFFS

"Jim Dandy" Sewed and Loose Buffs are better Buffs at lower cost to you, built for satisfactory service. What size and quantity may we quote you? Write today.

Now, more than ever before, you need lowest prices on best **Buffs, Polishing Compositions, Anodes and Chemicals.** You get these at

THE ODEN CORPORATION
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It costs more than some, but
It goes further.
It does better work.
It is not loaded with filler.
It is said to be the best cleaner on the market by those who use it.

THE ELECTRO TEC CLEANER

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DIPPING AND PLATING
BASKETS
Made All Shapes, Sizes and Meshes and of All Kinds of Wire. Send for Circular.

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A Sure Thing

IT'S a sure thing that when you order Magnus Cleaners you are getting the best cleaner at the best price. Why fish around? Drop us a line.

When the Magnus representative calls, ask to see his book of photographed orders. Look at the million dollar concerns using Magnus Cleaners. That ought to convince you, that we can save **you** money too. May we tell you about our

FREE TRIAL OFFER?

MANUFACTURED BY

Magnus CLEANERS

MAGNUS CHEMICAL CO.

475 Kent Ave., Brooklyn, N. Y.

FELT

We shall be glad to have your specifications for analysis and recommendation.

UNIFORMITY

ABSOLUTE UNIFORMITY of raw materials—measures which insure uniformity of felting (with the consequent absence of "soft spots")—these are the things that produce best quality work and effect economical operation for platers who use

Polishing Felts made by

American Felt Company

TRADE MARK

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SOLVAY

STANDARD IN
SODA
SINCE 1881

There Should be no Mystery

about alkali products used for metal cleansing. Users are entitled to know exactly what they contain, and how they act. Before adopting any cleanser, have it analyzed—compare its contents and price with standard alkali products.

Buy on Specification

SOLVAY ALKALIES

for Metal Cleansing are

Modified Soda **Causticized Ash**
Caustic Soda **Soda Ash**

The use of these products
assures efficiency and economy.

Solvay Technical Service maintains a staff of experts who devote their attention to problems connected with the use of Solvay Products.

Solvay Technical Service will determine for you the right product to use for any special or unusual purpose. It is ready to give expert advice on any phase of metal cleansing. Consult it freely.

THE SOLVAY PROCESS CO.
SYRACUSE, N. Y.

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Selling Agents: Wing & Evans, Inc.
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331 Fourth Ave., PITTSBURGH, PA.

A Scientific Talk on Metal Cleaning

THE active element in all cleaners where grease and oil are to be removed is *alkali*. Soap is useful as an aid to emulsification when heavy mineral oil is present.

The efficiency of the alkali depends upon its presence in a form known as Hydroxyl Ions. Caustic is high in ionized alkali but has many disagreeable features.

No workman is efficient when working around a caustic tank.

He has to be too cautious.

ESCOLITE MINERAL CLEANER is also high in ionized alkali. Its minerals release the total amount carried, but control it. You obtain power, combined with safety—economy united with serviceability.

A few ounces to the gallon are sufficient for all your work. Buy a barrel and learn cleaning satisfaction thru Mineral-Controlled Alkali.

Write

ESCOLITE

LOCKPORT, N. Y., Detergent Specialists

The Electric Smelting & Aluminum Co., Inc., Sole Manufacturers
Emergency stocks at Detroit and Cleveland

KALYE

(Trade Mark)

FOR PREPARING METAL SURFACES FOR PLATING, &c.
SAMPLE CAN SENT FREE

Correspondence Solicited **Mention This Journal**

H. M. ANTHONY CO., Agent
261 Greenwich St., New York

FOR EFFICIENT AND ECONOMICAL METAL CLEANING

Address

NATROLIN

Greensburg, Pa.

PLATERS—Investigate

"Liquid Sulphur"

The Oxidizing Agent of today. Sample Free.

SULPHUR PRODUCTS CO.
Wilfred S. McKeon, Pres. **GREENSBURG, PA.**

Christmas Greetings

Because the spirit of Christmas is founded on the fact that the most universal principle of life is the kinship of humanity, this thought causes the business world to pause and take inventory of the moral and spiritual values both social and commercial.

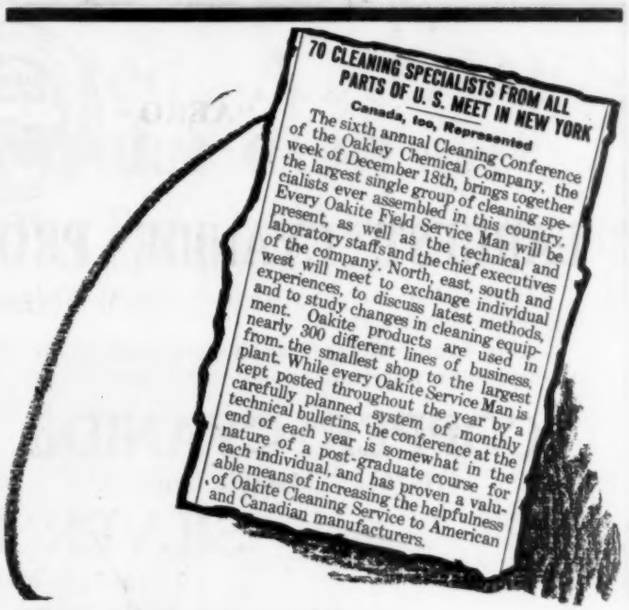
On Christmas day we focus this spirit of Brotherhood; petty differences vanish and a common ground of fraternity and fellowship touches our lives with broader values, and the urge of service.

This season, too, affords an opportunity to emphasize these spiritual factors. Service, courtesy, and good will are each given their place and the warm personal touch of brotherhood invests us with a broader life.

In this spirit we join with you in the heartiest Holiday Greetings and look forward with you to a continuance of those happy relations which have made our business contact such a real pleasure.

THE J. B. FORD CO.

Wyandotte, Mich.


70 CLEANING SPECIALISTS FROM ALL PARTS OF U. S. MEET IN NEW YORK
Canada, too, Represented
The sixth annual Cleaning Conference of the Oakley Chemical Company, the week of December 18th, brings together the largest single group of cleaning specialists ever assembled in this country. Every Oakite Field Service Man will be present, as well as the technical and laboratory staffs and the chief executives of the company. North, east, south and west will meet to exchange individual experiences, to discuss latest methods, and to study changes in cleaning equipment. Oakite products are used in nearly 300 different lines of business, from the smallest shop to the largest plant. While every Oakite Service Man is kept posted throughout the year by a carefully planned system of monthly technical bulletins, the conference at the end of each year is somewhat in the nature of a post-graduate course for each individual, and has proven a valuable means of increasing the helpfulness of Oakite Cleaning Service to American and Canadian manufacturers.

What this means to you in possibilities of saving *money, time* and *labor* on your cleaning work

IT is quite possible you are handling your cleaning work with materials, equipment, and methods that you had every reason to believe were the best of their kind at the time they were introduced.

But cleaning equipment that was formerly regarded as best for some particular kind of work, has in many plating rooms given way to radically different equipment. One evidence of this is the more general and successful application of electric cleaning.

Another change that has been steadily taking place is the method of cleaning and copper-plating in one solution. There has been much thought given recently to the proper sequence of rinses in the plating room and when it is more economical to use a two-tank system in cleaning.

There are a lot of new ideas about getting more work out of cleaning equipment without adding to the equipment. There are many things that every plating room foreman who is considering the installation of new facilities will want to know.

It is only through men who devote *all* their time to industrial cleaning, such as Oakite Service Men, that you can keep posted on the latest developments, the newest ideas, and the most recent changes.

There is an Oakite Service Man in your vicinity. If you will drop us a line, we will have him personally report to you the new developments in cleaning brought out at this Conference. You assume no obligation in asking for this information.

OAKITE

MANUFACTURED BY

OAKLEY CHEMICAL CO.

18 THAMES STREET · NEW YORK

"AERO BRAND"

LARGEST CYANIDE PRODUCERS IN THE WORLD

In less than six years we have become the largest producers of Cyanide in the world. Our process has revolutionized the art.

Aero Brand Metal Cyanides are made to the most rigid standards—thoroughly dependable as to quality, uniformity and supply—and our prices are attractive.

COPPER CYANIDE
(70-70½% Metallic Copper)

ZINC CYANIDE
(55-55½% Metallic Zinc)

SILVER CYANIDE
(80½% Metallic Silver)

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Sodium Cyanide (Briquettes) Copper Cyanide Zinc Sulphate Copper Carbonate
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Lasts Twice as Long or Costs Half as Much

Pressto Grade "C" Polishing Wheels
Reg. U. S. Pat. Off.

will do all polishing and buffing operations at a saving of 50% over any other wheels.

Send for sample wheel on twenty-day free trial offer.

Grade "C"—Polishing

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DELOYE Patented ANODES

HIGH PURITY UNIFORM CASTINGS

NICKEL
COPPER

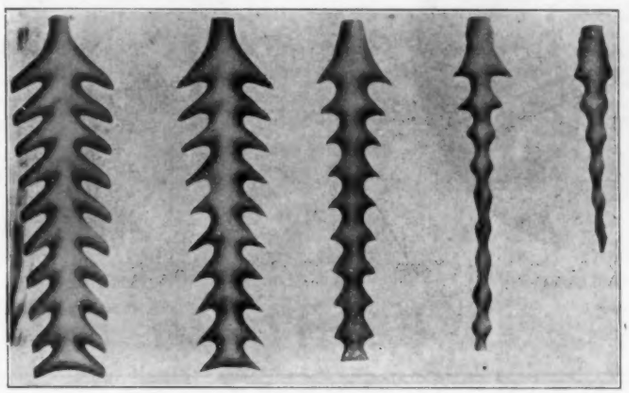
The Deloye Costs No More Than Other Shapes
Standard Lengths 12-15-18-24-30-36 inches
Weigh Approximately 1 lb. to the inch

BRASS
ZINC

LESS SCRAP

BETTER CORROSION

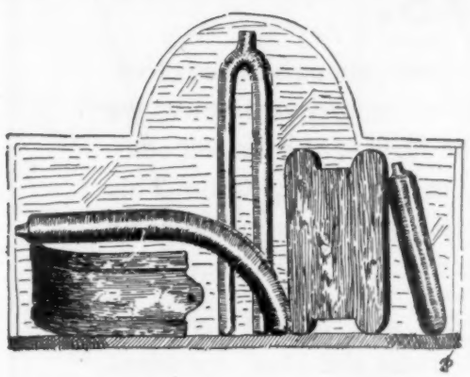
BETTER DEPOSIT



This is an actual photograph, showing how the Deloye Patented Nickel Anodes are dissolved in the Process of Nickel Plating.

WE CAST ANY SHAPE

APOTHECARIES HALL CO., Waterbury, Conn.

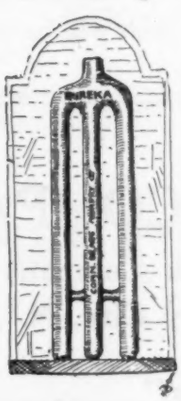


Eureka Tri-Bar Nickel Anodes

This anode provides for greater efficiency by allowing the solution to pass between the bars—leaving a large exposed surface from which to take the metal—naturally giving a quicker action.

No waste—as all three bars deposit the metal equally.

Give it a trial.



Connecticut Anodes—

Nickel - Brass - Copper - Zinc

Any Size—Any Shape

We know, from long experience, how to make good, free-working anodes. You benefit from our special process of manufacture which enables us to quote low prices. Tell us your requirements and get our quotations.

Your inquiries and orders will receive careful attention. Our prices and our service are designed to secure and hold your trade.

Connecticut Brass Foundry Company

664 East Main Street, Waterbury, Conn.

THE BIAS BUFF
(Loose)

THE BIAS BUFF (Sewed)
(Spirally or Concentrically)

Tripoli For Use With Bias Buffs.

We have been looking for some time for a Tripoli good enough to be recommended with our Bias buff. After experimenting with a number of brands, we have made arrangements for the exclusive sale in the East of the Tripoli compound made by the Scovill Manufacturing Company of Waterbury, Conn. This Tripoli has been developed by the Scovill Manufacturing Company for their own use after years of experimentation, and we recommend it without question.

The BIAS BUFF and the SCOVILL TRIPOLI make the ideal combination for your buffing room. Samples and prices of both will be sent on request.

THE BIAS BUFF & WHEEL COMPANY, Inc.

(Associated with the Riegel Sack Company)
430 Communipaw Avenue, Jersey City, N. J.

"It's the principle of the thing!"

OUR POLICY

We solicit an opportunity to discuss with production men, the details of Polishing and Buffing operations. If we find from our varied and extended experience that we can suggest methods that will permit you to make savings, we do so.

We have been making a study of polishing and buffing problems for a period of thirty years and know that we have been instrumental in saving others appreciable amounts in their polishing and buffing costs.

We do not claim that it would be possible for us to make savings for everyone, but in order that we may determine whether or not we could accomplish any savings in your plant, we would ask that you open correspondence with us. May we hear from you?

ENGINEERING DEPARTMENT

DIVINE BROTHERS COMPANY

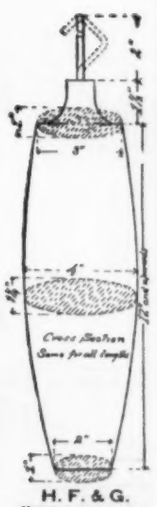
UTICA, N. Y.

HF&G

NICKEL ANODES
NICKEL SALTS

Single and Double

PURITY GUARANTEED



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The Harshaw Fuller & Goodwin Co.

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You serve your interests best by specifying

R&H CHEMICALS

Recognized as having established the

PURITY STANDARD

METAL CYANIDES

COPPER ZINC SILVER

SODIUM CYANIDE 96/98%

Equivalent to Potassium Cyanide 128/130% in Strength

We carry a full line of other **P**LATERS **C**HEMICALS

NICKEL SALTS NICKEL CHLORIDE

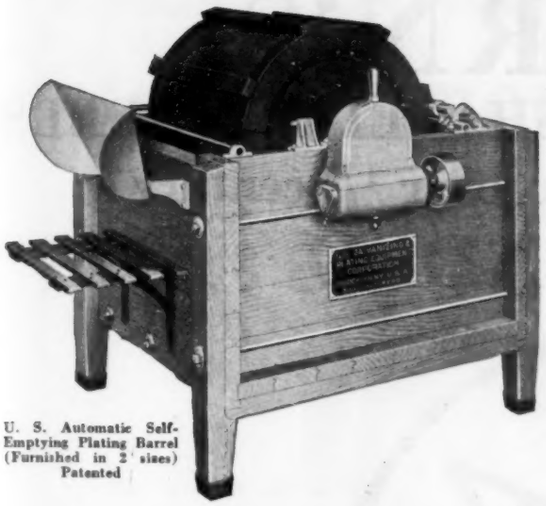
Polysulphide

Sodium Sulphocyanide

TIN CRYSTALS SODIUM STANNATE

The Roessler & Hasslacher Chemical Co.

709-717 Sixth Ave. ***New York City***



U. S. Automatic Self-Emptying Plating Barrel (Furnished in 2 sizes) Patented

Are you proud of your plating room?

Or is it "passed by" when visitors or your Directors inspect your plant—because of unsightly appearance, crude methods, sloppy conditions, and injurious acid fumes to be found there?

Many concerns are saving well earned pennies in their offices through the use of modern labor and time savings systems and equipment,—while letting dollars slip away by clinging to crude, old-fashioned methods in their plating department.

U. S. Automatic, Mechanical Apparatus will secure for you a plating department to which you and your operators can point with pride—a department clean and sanitary, free of confusion, with a minimum number of operating units, turning out a uniform quality of product with clocklike regularity.

You profit—through the saving of labor, of floorspace, of chemicals and other materials; by increase in operating efficiency; by improved quality and quantity of products; and by satisfied operators.

U. S. Automatic, Mechanical Apparatus represents the last word in up to date equipment for electroplating, electrogalvanizing, cleaning, pickling, neutralizing, rinsing, drying and allied operations. One of our Engineers will be glad to discuss your problem with you, with no obligation on your part.

U. S. Automatic Cleaning, Pickling, Acid Dip, Neutralizing, Rinsing & Drying Equipment. (Patented)

U. S. Automatic Moving Cathode Plating Apparatus (Furnished in 24 sizes) (Patented)

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U.S. GALVANIZING & PLATING EQUIPMENT CORPORATION

MANUFACTURERS – INCORPORATED 1896

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- ☐ U. S. Moving Cathode Plating Apparatus.
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have stood the tests for over 1/4 century

NOW BRANDED

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For long run economy they have never been equalled.

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SHEET FELT for all purposes

Our goods are STANDARD and WELL SEASONED.

Felted by a special process they weigh lighter per sheet or wheel.

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ONE PRICE EVERYWHERE

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Inside Anode Plating Barrel

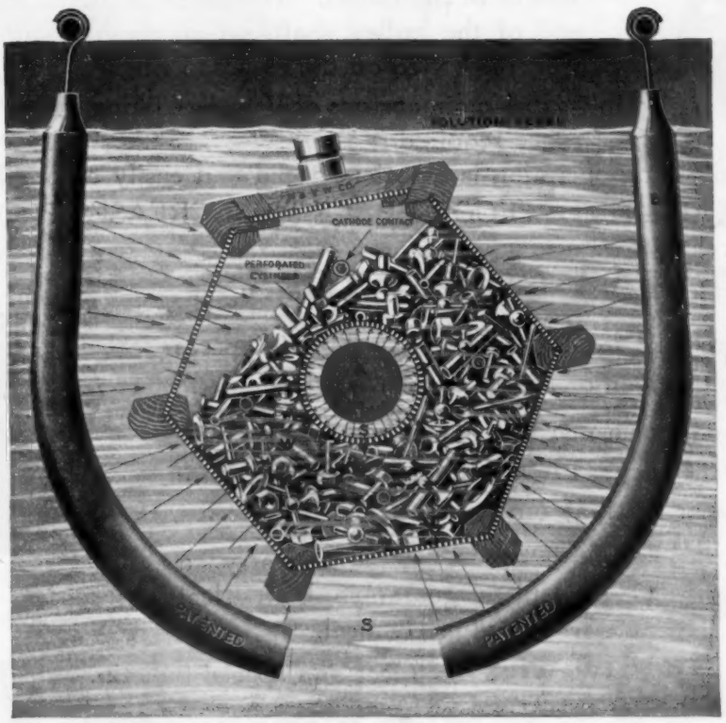
Mechanically and Electrically Correct

The most efficient Plating Barrel made.

The barrel is entirely submerged.

It will plate larger quantities of work per batch, than other style barrels.

The constant tumbling, churning motion of both the barrel and the work causes all parts of the solution to be thoroughly agitated, consequently of a uniform density.



Due to the low resistance construction features of this barrel a current pressure of only 5 to 6 volts is all that is required. This means a saving in electric power.

The illustration represents a cross section view of our inside anode, perforated celluloid plating barrel loaded with work.

A. Inside anode surrounded by solution and a perforated celluloid cylinder. (Worn anodes easily removed and replaced).

B. Outside curved elliptic anodes.

C. Cathode contact rods.

W. Work (Unusually large quantities of work can be plated in this barrel).

S. Plating solution.

→ Directions of throw of metallic deposit.

Note the very large area of active work surface presented to the anodes.

All of the outer portion of the mass of work, as well as all of that portion surrounding the inside center anode is constantly receiving the metallic deposit.

Write for Bulletin No. 113.

Manufactured by

The Hanson & Van Winkle Company

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The perfectly balanced Burnishing Barrel. Requires only ¼ H. P. to operate.

A heavy cast iron ring around the barrel, supported on either side by the main trunnions, is machined inside and contains eight sets of roller bearings, which carry the entire weight of the Barrel. The Barrel is driven by a pinion on the end of the pulley shaft, which meshes with a circular rack which is bolted on the cast iron ring.

Inside dimensions of Barrel 24″ long by 11″ diameter. Floor space required 3′ by 4′.

The loading and unloading operation is especially rapid and easily accomplished.

It saves POWER—TIME—FLOOR SPACE and INCREASES PRODUCTION.

THE STEVENS GENERATORS

They are built in any size from 75 amperes to 9,000 amperes capacity—either Belt Driven or Direct Connected to Motors.

I offer in this Generator a machine of the highest Commercial and Electrical efficiency. I invite the most exacting comparison with any other machine on the market.

These Generators carry a complete guarantee both electrical and mechanical.

Write for prices and special bulletin.

THE CROWN PLATING BARREL

A mechanical plating barrel which practically eliminates all of the objectionable features in barrel plating.

The loading and unloading device is particularly simple, and accomplished without any loss of solution.

The electrical connections are large and the contact inside of the barrel is absolutely positive, insuring most rapid production.

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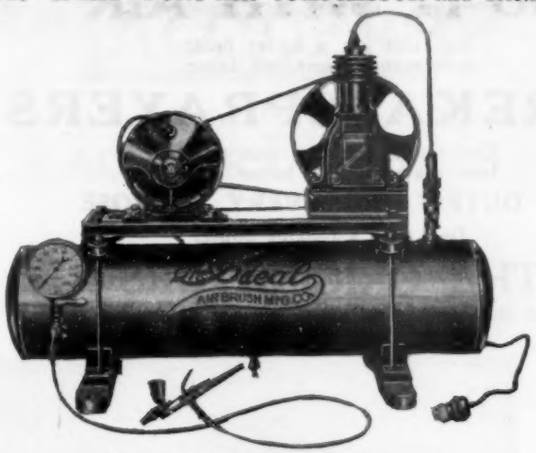

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MAKERS OF INDUSTRIAL CHEMICALS
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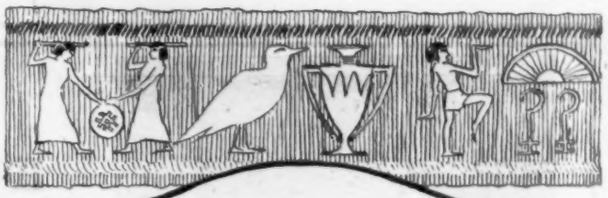

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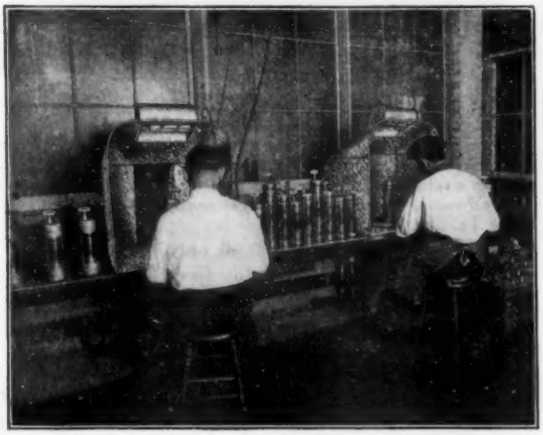

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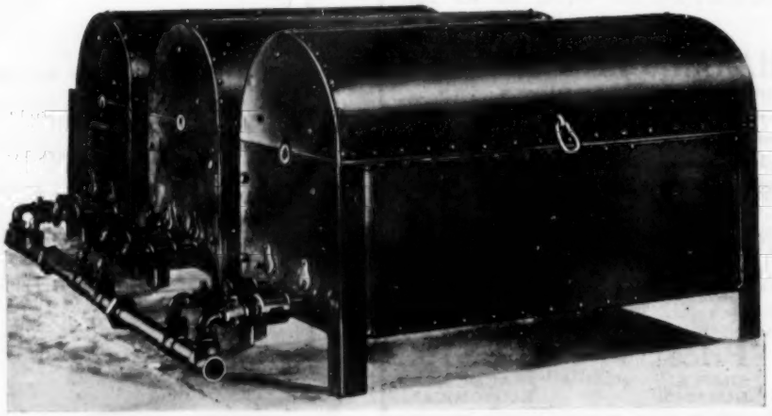

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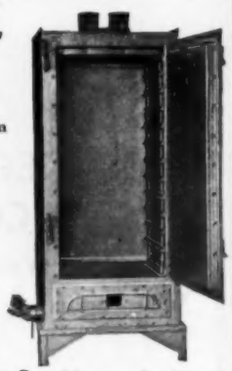

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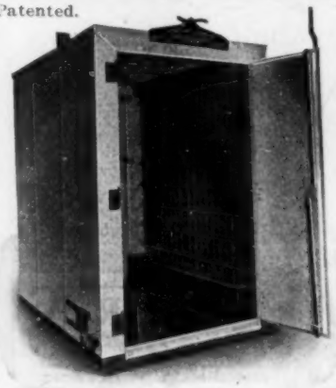

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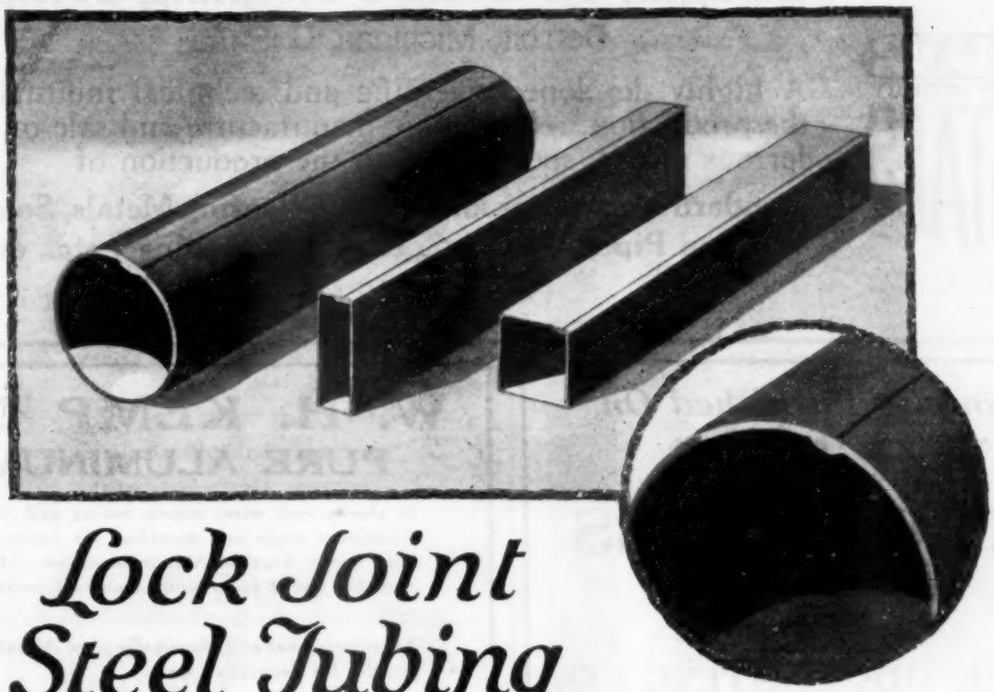

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Two—Monarch (Steel-Harvey) tilting type crucible furnaces; No. 225 crucible capacity.

One—Same type for No. 300 crucible capacity.

These furnaces are completely equipped with burners and piping for fuel oil; also smoke hoods and revolving ventilator piping.

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One—50 gallon oil settling tank, together with the necessary piping; also a lot of circular brick covers and linings.

This material is in first class condition and will be sold cheap.

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FOR SALE—1 CYPRUS TANK, 1⅞" stock.
Size, 8 ft. long,
3 ft. wide,
3 ft. deep, bolted.
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FOR SALE—Complete job plating plant in one of Ohio's western cities, population 20,000. Good reason for selling; only job shop between Dayton and Toledo. A bargain if sold soon. Address:

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FOR SALE—Porcelain Enamel Formulas in all colors for sheet and cast iron.

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Inquiry 2999—Please send us the names of the largest manufacturers of leadite, a composition for calking water joints.

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Inquiry 3006—Where can we buy trichlorethane mentioned on page 398, October issue, for cleaning mineral oil from steel parts?

Inquiry 3007—Can you tell me who makes the Howard alloy press used in lead works, U. S. Patent 563,769, July 14, 1896, or any similar machine? Also Miller lead molding machine. Am interested in both.

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TRADE WANTS—Continued

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Platers' and Polishers' Equipment and Supplies.
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SITUATION OPEN—Brass Foundry Foreman. Employ twenty (20) molders on light and heavy jobbing and production work in brass and aluminum. Located in southwestern Ohio. Give details in first letter.

OHIO,
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SITUATION WANTED—Young man with executive ability, experienced in the buying of materials, production and sales, as well as office management. A good correspondent and knowledge of accounting. Have traveled considerably and am thoroughly familiar with markets. Am 36 years old, unmarried and willing to go anywhere.

Especially experienced in metal novelty business.

Producer of finest nickel finish and also originator of the biggest selling metal novelty in recent years. Have the ability to create and design original advertising specialties.

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EXECUTIVE ABILITY,
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SITUATION WANTED—Salesman of executive ability and practical manufacturing experience, would represent a reputable manufacturing concern locally or in eastern territory. Address:

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Care THE METAL INDUSTRY.

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SITUATION WANTED—As foreman with a reliable manufacturer by man 33 years of age. At present employed by one of the largest and best known Phonograph Manufacturers as general foreman of their polishing, plating, and lacquering departments, employing from 60 to 75 people in these departments. Plating gold, silver, nickel, copper and brass on die castings, aluminum steel and brass. Getting excellent results from help and production, and have good reasons for making change. Will give present employers for reference. No objection to small town.

RELIABLE,
Care THE METAL INDUSTRY.

TRADE WANTS—Continued

SITUATIONS WANTED—Continued

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SITUATION WANTED—Superintendent or general foreman familiar with manufacture of plumbers' or steamfitters' supplies, practical mechanic, best references. Location immaterial. Address:

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SITUATION WANTED—By A-1 brass shopman to take charge of shop. Specialist on steam and plumber goods. Large experience in quantity production and modern brass shop practice. Exceptional references. Address:

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SITUATION WANTED—Architectural and statuary bronze fitter would like to connect with some reliable firm. Have had 25 years' experience in these lines. 15 years with my present position. Capable of reading blueprint and layout work. Can furnish the best of references. Address:

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SITUATION WANTED—By a Foreman plater, a man in all finishes of Metals and can handle help in a very efficient way. Will furnish high-grade reference. For further information address:

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SITUATION WANTED—By a foreman plater of many years' experience, who is thoroughly capable of taking charge of a plating plant. Address:

EXPERT PLATER,
Care THE METAL INDUSTRY.

PLATER

SITUATION WANTED—Electro Plater, one who can supervise all branches of electro deposition, also polishing, buffing, lacquering, japanning and enameling. At present employed in the above capacity, capable of handling men and in securing production. Would like to correspond with manufacturer desiring the services of a plater with the above qualifications. Middle West location preferred. Address:
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PLATER

SITUATION WANTED—Plater, young man, 26 years of age, 8 years' experience in Nickel, Copper, Silver and Brass. I can polish, buff and lacquer. Can install finishing department. Desires a permanent position with a concern that can use a working foreman or assistant foreman. A first-class man on nickel, polished or barrel burnished. NOVEMBER 1,
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in
The Metal Industry

OUR TWENTIETH YEAR
ANNUAL REVIEW NUMBER

will be issued in JANUARY, 1923

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Commercial Solvents Corp., Terre Haute, Ind.

ACID-PROOF STONEWARE (See Acid pumps; Dipping Baskets.)

ACID PUMPS, STONEWARE

General Ceramics Co., New York.

ACIDS

Hydrofluoric

General Chemical Co., Philadelphia, Pa.

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Hegeler Zinc Co., Danville, Ill.
New Jersey Zinc Co., New York.

Sulphuric

Du Pont, E. I., de Nemours & Co., Wilmington, Del.

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Watson-Stillman Co., New York.

AEROPLANE DOPE

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Zeller Lacquer Mfg. Co., Inc., New York.

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General Electric Company, Schenectady, N. Y.
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Nikolas, G. J., Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.

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Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
Nikolas, G. J., Co., Chicago, Ill.

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Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

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Nikolas, G. J., Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.

AIR AND GAS PRE-MIXING BURNERS (See Burners.)

ALCOHOL, BUTYL

Commercial Solvents Corp., Terre Haute, Ind.

ALLOYS (See also Kind Wanted.)

Non-Ferrous

American Brass Co., Waterbury, Conn.

Brass, Bronze, Nickel, Silver

American Brass Co., Waterbury, Conn.

ALUMINUM (See Ingots, Sheet, Wire, Rod etc.)

ALUMINUM ALLOYS

American Boron Products Co., Reading, Pa.
Great Western Smelting & Refining Co., St. Louis, Mo.

AMMETERS (See also Electrical Apparatus and Equipment.)

Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.

AMMONIUM CHLORIDE (Sal Ammoniac.)

Roessler & Hasslacher Chemical Co., New York.

AMYL ACETATE

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Van Schaack Bros., Chemical Works, Chicago, Ill.
Zeller Lacquer Mfg. Co., Inc., New York.

ANNEALING FURNACES

Oil or Gas

Kenworthy, Chas. F., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Surface Combustion Co., New York.

ANODES

Brass and Bronze

Apothecaries Hall Co., Waterbury, Conn.
Connecticut Brass Foundry Co., Waterbury, Conn.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
Rome Brass and Copper Co., Rome, N. Y.
Stevens, Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Copper

Apothecaries Hall Co., Waterbury, Conn.
Connecticut Brass Foundry Co., Waterbury, Conn.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Hussey, C. G., & Co., Pittsburgh, Pa.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
Rome Brass and Copper Co., Rome, N. Y.
Stevens, F. B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Gold

Handy & Harman, New York.

Nickel

Apothecaries Hall Co., Waterbury, Conn.
Connecticut Brass Foundry Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Lasalco, Inc., St. Louis, Mo.
Metal Finishers' Supply Co., New York.
Munning, A. P., & Co., New York-Chicago.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Wiarda, John C., & Co., Brooklyn, N. Y.

Platinum

Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.

Silver

Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.

Zinc

Apothecaries Hall Co., Waterbury, Conn.
Connecticut Brass Foundry Co., Waterbury, Conn.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Munning, A. P., & Co., New York-Chicago.
New Jersey Zinc Co., New York.

ANTI-FRICTION METAL (See also Babbitt Metal, and Bearings.)

Ajax Metal Company, Philadelphia, Pa.

ANTIMONY METAL

Leavitt, C. W., & Co., New York.

AQUA AMMONIA

American Cyanamid Co., New York.

ASSAY CRUCIBLES

Sand

Joseph Dixon Crucible Company, Jersey City, N. J.

ASSAYERS, AND CHEMISTS (See also Testing Laboratories.)

Pitkin, Lucius, Inc., New York.

AUTOMATIC MACHINERY (See Kind Wanted.)

AUTOMATIC POLISHING MACHINES

Excelsior Tool & Machine Co., E. St. Louis, Ill.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

AUTOMOBILE FORGINGS

Rome Mfg. Co., Rome, N. Y.

BABBITT METAL (See also Bearings.)

Ajax Metal Co., Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.

BABBITT MOLDS (See Molds.)

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)

Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
No-Dust Drying Machine Co., Providence, R. I.

BALLS, STEEL (See Steel Balls.)

BARS; SILVER, GOLD, PLATINUM

Handy & Harman, New York.

BEARINGS (Also see Babbitt Metal and Anti-Friction Metal.)

Babbitt

Ajax Metal Co., Philadelphia, Pa.

Bronze

American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.

BINS AND RACKS, STEEL

Lupton's, David, Sons Co., Philadelphia, Pa.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)

Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.

BLOWERS, HIGH PRESSURE

Leiman Bros., New York.

BOILER INSULATION (See Brick, Insulating; Insulating Cement.)

BOILER SETTING (See Fire Cement.)

BOLT, SCREW AND NUT MACHINERY

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

BORONIC ALLOYS

American Boron Products Co., Reading, Pa.

BOTTOM PLATES, STEEL

Wadsworth Core Machine & Equipment Co., Akron, Ohio.

BRASS (See Brass Mill Products; Wire Mill Products; Anodes; Castings; Die Castings; Forgings; Ingots; Rods and Bars; Sheets; Strip Metal; Tubes; Wire.)

BRASS FOUNDERS (See Castings.)

BRASS FOUNDRY EQUIPMENT & SUPPLIES (See Kind Wanted.)

BRASS MILL ENGINEERS (See Engineers.)

BRASS MILL MACHINERY (Also See Kind Wanted.)

Garrison, A., Foundry Co., Pittsburgh, Pa.
Sundh Engineering & Machine Co., Philadelphia, Pa.

BRASS MILL PRODUCTS

Baltimore Brass Co., Baltimore, Md.
Western Cartridge Co., East Alton, Ill.

BRASS; SHEET WIRE; ROD, TUBE (Also see Wire Mill Products; Rods and Bars; Sheets; Strip Metals; Tubes; Wire, Etc.)

American Brass Company, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Bristol Brass Co., Bristol, Conn.
Dallas Brass & Copper Co., Chicago, Ill.
Dueber Watch Case Mfg. Co., Canton, O.
Hendricks Bros., New York.
Manhattan Brass Co., New York.
Rome Brass and Copper Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitehead Metal Products Co., New York.

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BRASS WORKING LATHES (See Lathes.)

BRICK (Also see Fire Brick.)

Insulating

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

BRITANNIA METAL

Standard Rolling Mills, Inc., Brooklyn, N. Y.

BRONZE (See also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.)

Bearing

American Brass Co., Waterbury, Conn.

Phosphor, Tobin, Manganese

American Brass Co., Waterbury, Conn.

BRONZING LIQUID

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

BRUSHES

Hand

Blumenthal, H., & Co., New York.
Gornell, E., & Sons, Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Nikolas, G. J., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Wheel

Blumenthal, H., & Co., New York.
Gornell, E., & Sons, Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning, A. P., & Co., New York-Chicago.

BUFFING CAKE, PLATINUM (See Buffing and Polishing Compositions.)

BUFFING MACHINES, AUTOMATIC (Also see Polishing Lathes and Heads.)

Divine Bros. Co., Utica, N. Y.

BUFFING AND POLISHING COMPOSITIONS

Apothecaries Hall Co., Waterbury, Conn.
Burns, E. Reed, Mfg. Corp., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Company, Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Metal Finishers' Supply Co., New York.
Munning, A. P., & Co., New York-Chicago.
Oden Corp., Whitestone, L. I., N. Y.
Stevens, Frederic B., Detroit, Mich.
Warren Products Co., New York.

BUFFING AND POLISHING WHEELS (Also see Buffs.)

Canvas, Cotton, Etc.

Apothecaries Hall Co., Waterbury, Conn.
Bias Buff & Wheel Co., Jersey City, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson & Van Winkle Co., Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
Metal Finishers' Supply Co., New York.
Munning, A. P., & Co., New York-Chicago.
Warren Products Co., New York.

Felt

American Felt Co., Boston, Mass.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson & Van Winkle Co., Newark, N. J.

Sheepskin

Yorkville Mfg. Co., Brooklyn, N. Y.

BUFFS (Also see Buffing and Polishing Wheels.)

Apothecaries Hall Co., Waterbury, Conn.
Bias Buff & Wheel Co., Jersey City, N. J.
Burns, E. Reed, Mfg. Corp., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Metal Finishers' Supply Co., New York.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
Oden Corp., Whitestone, L. I., N. Y.
Warren Products Co., New York.

BUILDING PAINT SPRAYERS

DeVilbiss Mfg. Co., Toledo, O.
Spray Engineering Co., Boston, Mass.

BURNERS (Also see Furnaces.)

Air and Gas Pre-Mixing

Monarch Engineering & Mfg. Co., Baltimore, Md.

Oil or Gas

Campbell Hausfeld Co., Harrison, Ohio.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

BURNISHING AND POLISHING BARRELS

Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Henderson Bros. Co., Waterbury, Conn.
No-Dust Drying Machine Co., Providence, R. I.
Smith-Richardson Co., Attleboro, Mass.

BURNISHING COMPOUNDS AND CHIPS (Also see Soap.)

Abbott Ball Co., Hartford, Conn.
International Chemical Co., Philadelphia, Pa.

BUTANOL (BUTYL ALCOHOL)

Commercial Solvents Corp., Terre Haute, Ind.

BUTYL ALCOHOL

Commercial Solvents Corp., Terre Haute, Ind.

BUTYL ACETATE

Zeller Lacquer Mfg. Co., Inc., New York.

CANVAS WHEELS (See Buffing and Polishing Wheels.)

CASE HARDENING COMPOUND

American Cyanamid Co., New York.

CASE HARDENING MATERIALS

Buchanan, C. G., Chemical Co., Cincinnati, O.

CASTINGS

Aluminum

Light Mfg. & Foundry Co., Pottstown, Pa.

Brass, Bronze and Composition

Ajax Metal Company, Philadelphia, Pa.
American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.
Connecticut Brass Foundry Co., Waterbury, Conn.

Copper

Connecticut Brass Foundry Co., Waterbury, Conn.

Die

Beebe Die Casting Co., Chicago, Ill.
Light Mfg. & Foundry Co., Pottstown, Pa.

Nickel

Connecticut Brass Foundry Co., Waterbury, Conn.

Zinc

Connecticut Brass Foundry Co., Waterbury, Conn.
New Jersey Zinc Co., New York.

CAUSTICIZED ASH

Solvay Process Co., Syracuse, N. Y.

CAUSTIC SODA

Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.
International Chemical Co., Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.

CEMENT (See Fire Cement; Insulating Cement.)

CENTRIFUGAL DRYERS AND EXTRACTORS (Also see Drying-Out Machines.)

Tolhurst Machine Works, Troy, N. Y.

CHEMICALS. DEALERS IN ALL KINDS (Also see Kind Wanted.)

Cooper, Charles, & Company, New York.
Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.

CHEMISTS, CONSULTING (See Assayers and Chemists; Testing Laboratories.)

CHLORIDE OF IRON

Roessler & Hasslacher Chemical Co., New York.

CHROMIUM

Metal & Thermit Corp., New York.

CHUCKS, SPINNING, ROUND & OVAL

Pryibil, P., Machine Co., New York.

CINDER CRUSHERS (See Crushers and Pulverizers; Reclaiming Machinery.)

CLEANERS, METAL, WASTE, GENERAL

Electric Smelting & Aluminum Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.

CLEANING APPARATUS, AUTOMATIC METAL (Also see Pickling Machines.)

U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

CLEANING COMPOUNDS (See also Fig Cleanser; Pickling Compounds, Whale Oil Soaps.)

Metal

Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Munning, A. P., & Co., New York-Chicago.
Oakley Chemical Co., New York.
S. H. Chemical Co., Boston, Mass.
Solvay Process Co., Syracuse, N. Y.
Stevens, Frederic B., Detroit, Mich.

COCK GRINDERS, AUTOMATIC

Turner Machine Co., Philadelphia, Pa.

COMPOSITION METAL (See Castings; Ingot, Etc.)

COMPOSITIONS (See Buffing and Polishing Compositions; Flooring Compositions.)

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING

International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.

COMPRESSORS, AIR & GAS (See Air Compressors.)

CONCENTRATING TABLES (See also Reclaiming Machinery.)

Mine & Smelter Supply Co., New York.

CONSULTING METALLURGIST

Krom, L. J., New York.

CONTRACT WORK (See Casting; Die-Castings; Dies; Electro-Galvanizing; Electro-Plating; Forgings; Hot Galvanizing and Tinning; Plating, Barrel Method; Polishing and Burnishing, Etc.)

COPPER (Also see Anodes; Castings; Ingots; Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)

Sheet, Wire, Rod, Tube

American Brass Co., Waterbury, Conn.
Rome Brass and Copper Co., Rome, N. Y.
Wheeler Condenser & Engineering Co., Carteret, N. J.

COPPER-ALUMINUM, BORONIC

American Boron Products Co., Reading, Pa.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

COPPER BEARING MATERIAL, BUYERS OF (Also see Drosses, Residues, Etc.)

COPPER, BORONIC
American Boron Products Co., Reading, Pa.

COPPER, CARBONATE OF
Cooper, Chas., & Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Wiarda, John C., Co., Brooklyn, N. Y.

COPPER-CLAD WIRE, ROD, ETC. (See Wire.)

COPPER-CYANIDE
American Cyanamid Co., New York.
Hardy, Charles, & Ruperti, Inc., New York.
Roessler & Hasslacher Chemical Co., New York.

COPPER-NICKEL, BORONIC
American Boron Products Co., Reading, Pa.

CORE MACHINES
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

CORE OIL AND COMPOUNDS
Stevens, Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation Oven.)

CORE OVENS

Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.
Steiner, E., & Co., Newark, N. J.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, O.

Oil and Gas
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, O.

CORE SAND MIXERS
National Engineering Co., Chicago, Ill.

CORE TRAYS, STEEL
Wadsworth Core Machine & Equipment Co., Akron, O.

COUPLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CRANES, HAND, POWER AND ELECTRIC TRAVELING
Northern Engineering Works, Detroit, Mich.

CRUCIBLES, GRAPHITE
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Taylor, Robt. J., Inc., Philadelphia, Pa.
Warren Products Co., New York.

CRUCIBLE TONGS (See Tongs.)

CRUSHERS AND PULVERIZERS (See also Reclaiming Machinery.)
Sly, W. W., Mfg. Co., Cleveland, Ohio.
Standard Equipment Co., New Haven, Conn.

CUPRO-NICKEL (See Brass Mill Products.)

CUTTING, STRAIGHTENING & FORMING MACHINERY

Wire
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.

Strip Metal
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, F. B., Co., New Haven, Conn.

CYANIDE (See also Copper-Cyanide; Silver Cyanide; Sodium Cyanide; Zinc Cyanide.)
American Cyanamid Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.

CYANIDE SORE REMEDY
Wambaugh, E., & Co., Goshen, Ind.

DEOXIDIZERS, METAL (See Fluxes.)

DESIGNS, FLATWARE & HOLLOWWARE
Shelton Tool & Machine Co., Derby, Conn.

DIE-CASTINGS

Brass
Beebe Die Casting Co., Chicago, Ill.

White Metal
Light Mfg. & Foundry Co., Pottstown, Pa.

DIES

Ornamental Forging & Blanking
Shelton Tool & Mach. Co., Derby, Conn.

Sheet Metal Working
Bliss, E. W., Co., Brooklyn, N. Y.

DIPPING BASKETS

Automatic
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Stoneware
General Ceramics Co., New York.

Wire
Smith, John P., & Co., New Haven, Conn.

DOORS AND PARTITIONS, STEEL
Lupton's, David, Sons Co., Philadelphia, Pa.

DRAW BENCHES

Wire, Rod, Tube
Watson-Stillman Co., New York.

Light Wire
Leiman Bros., New York.

DRAWING AND STAMPING (See Metal Goods Made to Order; Stamping and Drawing.)

DRILLING MACHINES

Light Sensitive
Leiman Bros., New York.

DRINKING WATER SUPPLY SYSTEMS
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

DROP HAMMERS
Bliss, E. W., Co., Brooklyn, N. Y.

DROP LIFTERS (See also Presses, Drop Lifters for.)

Automatic
Miner & Peck Mfg. Co., Derby, Conn.

DROSSES, RESIDUES, ETC., BUYERS OF (Also see Metal Dealers, Old.)
Balbach Metals Corp., New York, N. Y.
Capper, Pass & Son, Ltd., Bristol, England.
Nassau Smelting & Refining Co., New York.

DRYERS (See Centrifugal Dryers; Ovens; Drying-Out Machines; Ladle Heaters and Dryers; Mold Dryers; and Dryers; Sawdust Drying-Out Boxes.)

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.

Automatic
Astle, H. J., & Co., Providence, R. I.
No-Dust Drying Machine Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)
American Foundry Equipment Co., New York.
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Kirk & Blum Mfg. Co., Cincinnati, O.
No-Dust Drying Machine Co., Providence, R. I.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bogue, Chas. J., Electric Co., New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
General Electric Company, Schenectady, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Jants & Leist Electric Co., Cincinnati, O.
Munning, A. P., & Co., New York-Chicago.
Stevens, Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bogue, Chas. J., Electric Co., New York.
General Electric Company, Schenectady, N. Y.

ELECTRIC CRANES (See Cranes.)

ELECTRIC FURNACES

Heat Treating
General Electric Company, Schenectady, N. Y.

Laboratory
General Electric Company, Schenectady, N. Y.

Melting
Ajax Metal Co., Philadelphia, Pa.
General Electric Company, Schenectady, N. Y.

ELECTRIC HOISTS (See Hoists.)

ELECTRIC OVENS (See Ovens; also Core Ovens.)

ELECTRICAL COPPER
Rome Brass and Copper Co., Rome, N. Y.

ELECTRO-GALVANIZING, JOB AND CONTRACT
Boston Tumble Barrel Plating Works, Boston, Mass.
Hassall, John, Inc., Brooklyn, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, etc.)

ELECTRO GALVANIZING MACHINES, AUTOMATIC (See Plating Machines, Automatic.)

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)
Boston Tumble Barrel Plating Works, Boston, Mass.
Hassall, John, Inc., Brooklyn, N. Y.
Sievering, Philip, New York.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See Kind Wanted.)

EMERY (Also see Abrasives.)
Crown Rheostat & Supply Co., Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill.-Glen Ridge, N. J.
Stevens, Frederic B., Detroit, Mich.

ENAMELING OVENS (See Ovens.)

ENAMELS

Colored
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Maas & Waldstein Co., New York.
Nikolas, G. J., & Co., Chicago, Ill.
Van Schaack Bros. Chemical Works, Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

Lacquer
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Van Schaack Bros. Chemical Works, Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

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Wood
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

ENAMEL SPRAYERS (See Sprayers.)

ENGINEERS
Furnace
Kenworthy, Chas. F., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Metallurgical
Krom, L. J., New York.

Polishing and Grinding
Divine Bros. Co., Utica, N. Y.

ESCUTCHEON PINS, ALL METAL
Hassall, John, Inc., Brooklyn, N. Y.

ETHYL ACETATE
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Nikolas, G. J., & Co., Chicago, Ill.
Zeller Lacquer Mfg. Co., Inc., New York.

EXHAUST BOOTHS AND BENCHES FOR LACQUERING
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

EXHAUST FANS AND HEADS (Also see Blowers and Blow Piping; Dust Collectors and Ventilating Systems.)
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.

EXHAUST WHEELS, ROLLER BEARING, BELT AND MOTOR DRIVEN
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

EXTRUDED SHAPES
Brass, Copper and Bronze
Rome Brass and Copper Co., Rome, N. Y.

EYELET MACHINES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

FACING SAND MIXERS
National Engineering Co., Chicago, Ill.

FACINGS (See Foundry Facings.)

FELT POLISHING
American Felt Co., Boston, Mass.

FELT POLISHING WHEELS (Also see Buffing and Polishing Wheels.)
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.

FELT SHEETS
American Felt Co., Boston, Mass.
Eastern Felt Co., Winchester, Mass.

FERRULES, BRASS AND COPPER
American Brass Co., Waterbury, Conn.
Rome Mfg. Co., Rome, N. Y.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.

FILM COATINGS
Waukegan Chemical Co., Waukegan, Ill.

FIRE CEMENT
Campbell-Hausfeld Co., Harrison, Ohio.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Quigley Furnace Specialties Co., New York.

FLOORING COMPOSITION
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

FLUXES
Metal Melting
American Boron Products Co., Reading, Pa.

Soldering and Tinning
Allen, L. B., Co., Inc., Chicago, Ill.
Johnson Mfg. Co., Chicago, Ill.

FORGINGS (Also see Automobile Forgings.)
Brass and Bronze
American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.
Rome Mfg. Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

FOUNDRY EQUIPMENT AND SUPPLIES (See Kind Wanted.)

FOUNDRY ENGINEERS (See Engineers.)

FOUNDRY FACINGS
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

FOUNDRY RIDDLES (See Sand Sifters.)

FOUNDRY SPRAYERS (See Sprayers.)

FUEL OIL, FURNACES
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Oil or Gas
Campbell-Hausfeld Co., Harrison, Ohio.
Hawley Down-Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Co., New York.
Surface Combustion Co., New York.

FURNACE CEMENT (See Fire Cement.)

FURNACE ENGINEERS (See Engineers.)

FURNACE INSULATION (See Brick, Insulating; Insulating Cement; Insulation, Furnace.)

FURNACES (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)

FURNACE TILE AND LININGS (Also see Fire Brick.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

FUSEL OIL
Nikolas, G. J., & Co., Chicago, Ill.

FUSEL OIL SUBSTITUTE
Commercial Solvents Corp., Terre Haute, Ind.

GALVANIZING (See also Electric Galvanizing, Job, and Contract; Hot Galvanizing, Job and Contract.)
New Jersey Zinc Co., New York.

GALVANIZING AND TINNING FURNACES (Also see Burners.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

GALVANIZING EQUIPMENT AND SUPPLIES (See Kinds Wanted. Also Plating Galvanizing Machines, Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)

GAS APPLIANCES
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

GAS BURNERS (See Burners.)

GATE CUTTERS (See Saws; Sprue Cutters.)

GENERATORS (See Dynamos; Motor-Generator Sets.)

GLUE FOR POLISHING
Divine Bros. Co., Utica, N. Y.

GLUE HEATERS AND POTS
Divine Bros. Co., Utica, N. Y.
General Electric Co., Schenectady, N. Y.

GOLD (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

GOLD, BORONIC
American Boron Products Co., Reading, Pa.

GRAPHITE PRODUCTS, PHOSPHORIZERS, STIRRERS, ETC. (Also see Crucibles.)
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Taylor, Robt. J., Inc., Philadelphia, Pa.

GRINDERS, SWINGING
Excelsior Tool & Machine Co., E. St. Louis, Ill.

GRINDING MACHINES
Connecticut Dynamo & Motor Co., Irvington, N. J.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Stevens, Frederic B., Detroit, Mich.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINDING WHEEL HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

HOISTS (Also see Cranes.)
Air; Chain, Electric, Pneumatic, Hydraulic
Northern Engineering Works, Detroit, Mich.

HOODS (Also see Dust Collectors and Ventilating Systems.)
Polishing and Grinding Wheel
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Spraying
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
De Vilbiss Mfg. Co., Toledo, Ohio.
Spray Engineering Co., Boston, Mass.

HOT GALVANIZING AND TINNING EQUIPMENT (See Burners; Galvanizing and Tinning Furnaces; Kettles; Tanks.)

HOT TINNING (See Hot Galvanizing and Tinning.)

HOT TINNING SUPPLIES (See Hot Galvanizing and Tinning Equipment.)

HYDRAULIC MACHINERY, PRESSES JACKS, ETC. (Also see Accumulators; Presses.)
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Watson-Stillman Co., New York.

INGOT MOLDS (See Molds.)

INGOTS (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)
Aluminum
Amalgamated Metals Selling Co., New York.
British Aluminum Co., New York and Toronto, Ontario.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Great Western Smelting & Refining Co., St. Louis, Mo.
Brass, Bronze and Composition
Ajax Metal Company, Philadelphia, Pa.
Henning, V., & Sons, Brooklyn, N. Y.
Whipple & Choate Company, Bridgeport, Conn.
Bronze
American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.
Copper
Balbach Metals Corp., New York, N. Y.
Hendricks Bros., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
Lead
United Metals Selling Co., New York.
Manganese-Bronze
Electric Smelting & Aluminum Co., Lockport, N. Y.
Whipple & Choate Company, Bridgeport, Conn.
Silver
Handy & Harman, New York.
Tin
Ajax Metal Co., Philadelphia, Pa.
White Metals
Michigan Smelting & Refining Co., Detroit, Mich.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

INSULATING BRICK, BLOCK, POWDER AND CEMENT (See Brick.)

INSULATING CEMENT, HEAT
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

INSULATION (Also see Brick, Insulating; Insulating Cement.)

Boiler
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.

Oven
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.

Furnace
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.

Pipe
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

IRON CASTINGS (See Castings.)

JAPAN REMOVERS
International Chemical Co., Philadelphia, Pa.

JAPANS, ALL KINDS
Du Pont, E. I., de Nemours & Co., Wilmington, Del.

JAPANNING BARRELS (See Tumbling Barrels.)

JAPANNING OVENS (See Ovens.)

JEWELERS' BRUSHES (See Brushes.)

JEWELERS' EQUIPMENT (Also see Kind Wanted.)
Leiman Bros., New York.
Smith-Richardson Co., Attleboro, Mass.

JEWELERS' ROLLS (See Rolls.)

JEWELERS' SOLDER (See Solders.)

JIGS, FIXTURES, ETC. (See Tools, Jigs, Fixtures.)

LABORATORIES (See Testing Laboratories.)

LACQUERING BARRELS (See Tumbling Barrels.)

LACQUERING, JOB AND CONTRACT
Boston Tumble Barrel Plating Works, Boston, Mass.
Sievering, Philip, New York.

LACQUER ENAMELS (See Enamels.)

LACQUER OVENS (See Ovens.)

LACQUERS

Colored
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Company, New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Van Schaack Bros. Chemical Works, Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

For Incandescent Lamps
Zeller Lacquer Mfg. Co., New York.

Metal
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Company, New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Van Schaack Bros. Chemical Works, Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

Wood
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Little Falls Chemical Co., Little Falls, N. J.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

LACQUER REMOVERS
International Chemical Co., Philadelphia, Pa.
Zeller Lacquer Mfg. Co., Inc., New York.

LACQUER SPRAYERS (See Sprayers.)

LADLE HEATERS AND DRYERS
Hawley Down-Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

LATHES (Also see Polishing Lathes.)

Pattern Makers
Pryibil, P., Machine Co., New York.

Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., Machine Co., New York.

LEAD-LINED TANKS (See Tanks.)

LEATHER POLISHING WHEELS (See Buffing and Polishing Wheels.)

LOCOMOTIVES, INDUSTRIAL (See Electric Locomotives.)

LUBRICANTS, Cutting and Grinding, Drawing, Stamping
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.

MAGNESIUM METAL

Sheet, Wire, Rod, Ribbon, Powder
Amalgamated Metals Selling Co., New York.
Leavitt, C. W., & Co., New York.
Norton Laboratories, New York.

MAGNETIC SEPARATORS (See also Reclaiming Machinery.)
Magnetic Mfg. Co., Milwaukee, Wis.
Paxson, J. W., Co., Philadelphia, Pa.

MANGANESE
Metal & Thermit Corp., New York.

MANGANESE-BRONZE (See Ingots.)

MANGANESE-COPPER (Also see Ingots.)
Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Metal & Thermit Corp., New York.

MANTLE DIP
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Nikolas, G. J., Co., Chicago, Ill.
Zeller Lacquer Mfg. Co., Inc., New York.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)

Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.

Oil or Gas
Campbell-Hausfeld Co., Harrison, Ohio.
Hawley Down-Draft Furnace Co., Easton, Pa.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Kenworthy, Chas. F., Inc., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Pit
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Reverberatory
Hawley Down-Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

METAL BRIQUETTES (See Briquet-Ingots.)

METAL CLEANERS (See also Cleaning Compounds.)
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.

METAL DEALERS (Also see Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of.)

Gold, Silver, Platinum
Radnai, Josef, New York.
Roessler & Hasslacher Chemical Co., New York.

New Metals
Nassau Smelting & Refining Co., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.

Old Metals
Henning, V., & Sons, Brooklyn, N. Y.
Metal Purchasing Co., New York.

Rare Metals
Radnai, Josef, New York.

Zinc
New Jersey Zinc Co., New York.

METAL DRYERS, CENTRIFUGAL
Tolhurst Machine Works, Troy, N. Y.

METAL GOODS MADE TO ORDER (Also see Stamping and Drawing.)
Kenworthy, Charles F., Inc., Waterbury, Conn.
Rome Mfg. Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.

METALLURGICAL ENGINEER
Krom, L. J., New York.

METAL POLISH
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

METAL RECLAIMING EQUIPMENT (See Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)

METALS (See also Kinds Wanted. Also Metal Dealers.)

Bearing
American Brass Co., Waterbury, Conn.

Extruded and Die Pressed
American Brass Co., Waterbury, Conn.

METALS, PLATED SHEET (See Plated and Polished Sheet Metals; Sheets.)

METALS, RARE (See Metal Dealers.)

METERS (Electrical Measuring.)
General Electric Co., Schenectady, N. Y.

MILLS, CRUSHING (See Crushers and Pulverizers.)

MILLS, PAN
National Engineering Co., Chicago, Ill.

MIXERS, SAND
National Engineering Co., Chicago, Ill.

MODELING AND CHASING, Plaster and Wax
Schehr, Geo. A., Cincinnati, O.

MOLD DRYERS, PORTABLE
Monarch Engineering & Mfg. Co., Baltimore, Md.

MOLDING MACHINES

Hand Operated
Turner Machine Co., Philadelphia, Pa.

Power
American Foundry Equipment Co., New York.
Turner Machine Co., Philadelphia, Pa.

MOLDING SAND (See Sand.)

MOLDS

Babbitt and Solder
Schweizer, Chas. K., St. Louis, Mo.

Ingot
Schweizer, Chas. K., St. Louis, Mo.

MOLD SPRAYERS (See Sprayers.)

MONEL METAL, Sheet, Rod, Tube, Wire, Etc.
Whitehead Metal Products Co., New York.

MOTOR CONTROL EQUIPMENT (See also Electrical Apparatus and Equipment.)
General Electric Co., Schenectady, N. Y.

MOTORS (Also see Electric Apparatus and Equipment.)

Electric
Eager Electric Co., Watertown, N. Y.
General Electric Co., Schenectady, N. Y.

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
General Electric Co., Schenectady, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Jantz & Leist Electric Co., Cincinnati, Ohio.
Metal Finishers Supply Co., New York.
Munning, A. P., & Co., New York-Chicago.

MUFFLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

MUNTZ'S METAL (See Sheets.)

NICHROME HEAT RESISTING ALLOYS (See Castings; Dipping Baskets, Wire.)

NICKEL (See Anodes; Castings; Ingots; Sheets; Wire; Etc.)

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

NICKEL BORONIC
American Boron Products Co., Reading, Pa.

NICKEL SALTS
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Chas., & Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.
Munning, A. P., & Co., New York-Chicago.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederic B., Detroit, Mich.
Wiarda, John C., & Co., Brooklyn, N. Y.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube, Castings; Forgings; Sheets; Etc.)

Sheet, Wire, Rod, Tube
American Brass Co., Waterbury, Conn.

OIL OF VITRIOL
Wiarda, John C., & Co., Brooklyn, N. Y.

OIL BURNERS (See Burners.)

OIL PUMPS (See Oil Storage Systems.)

OIL STORAGE AND PUMPING SYSTEMS
Monarch Engineering & Mfg. Co., Baltimore, Md.

OLD METALS (See Drosses, Residues, Etc., Buyers of; Metal Dealers.)

OVENS (Also see Burners; also Core Ovens.)

Enameling, Lacquering, Japanning
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
Steiner, E., & Co., Newark, N. J.

OVEN BURNERS (See Burners.)

OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation.)

OXIDIZING SOLUTIONS
Sulphur Products Co., Greensburg, Pa.

PAINT SPRAYERS (See also Sprayers.)
Spray Engineering Co., Boston, Mass.

PATTERN SHOP EQUIPMENT (See Lathes; Saws.)

PAVING BRICK, CORK (See Brick.)

PHOSPHOR BRONZE (See also Ingots.)
Ajax Metal Company, Philadelphia, Pa.

PHOSPHORIZERS (See Graphite Products.)

PHOSPHOR-COPPER (Also see Ingots.)
Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.

PHOSPHOR-COPPER, BORONIC
American Boron Products Co., Reading, Pa.

PHOSPHOR-TIN (See also Ingots.)
Ajax Metal Company, Philadelphia, Pa.

PHOSPHOR-TIN, BORONIC
American Boron Products Co., Reading, Pa.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING COMPOUND (See Cleaning Compounds.)

PICKLING MACHINES, AUTOMATIC
No-Dust Drying Machine Co., Providence, R. I.
Sundh Engineering & Machine Co., Philadelphia, Pa.
U. S Galvanising & Plating Equipment Corp., Brooklyn, N. Y.

PIPE, BRASS AND COPPER
American Brass Co., Waterbury, Conn.

PIPE AND BOILER COVERINGS, STEAM, ICE WATER, BRINE (See also Insulation.)

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.
National Sheet Metal Co., Peru, Ill.

PLATERS' BRUSHES (See Brushes.)

PLATERS' COMPOUND (See Whale Oil Soap.)

PLATING BARRELS, ROTARY
Lasalco, Inc., St. Louis, Mo.

PLATING AND GALVANIZING BARRELS
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
U. S. Galvanising & Plating Equipment Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Hanson & Van Winkle Co., Newark, N. J.
U. S. Galvanising & Plating Equipment Corp., Brooklyn, N. Y.

PLATING, BARREL METHOD, JOB AND CONTRACT (Also see Electroplating.)
Boston Tumble Barrel Plating Works, Boston, Mass.
Sievering, Philip, New York.

PLATING EQUIPMENT AND SUPPLIES (See Kind Wanted.)

PLATING GENERATORS
Lasalco, Inc., St. Louis, Mo.

PLATINUM (See Smelters and Refiners; Anodes; Bars; Metal Dealers; Sheets; Etc.)

PLATINUM BUFFING CAKE (See Buffing and Polishing Compositions.)

PLATINUM SCRAP (See Metal Dealers.)

PLUMBAGO (See Graphite Products.)

POLISHING ABRASIVES
Abrasive Company, Bridesburg, Philadelphia, Pa.

POLISHING BARRELS (See Burnishing Barrels.)

POLISHING COMPOSITION (See Buffing and Polishing Compositions.)

POLISHING DUST COLLECTING OUTFITS
Small
Leiman Bros., New York.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)

POLISHING FELTS
American Felt Co., Boston, Mass.
Eastern Felt Co., Winchester, Mass.

POLISHING HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

POLISHING LATHES AND HEADS
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Metal Finishers Supply Co., New York.
Munning, A. P., & Co., New York-Chicago.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)

Automatic
Excelsior Tool & Machine Co., E. St. Louis, Ill.

POLISHING MEAL FOR DRY BARREL TUMBLING
Yorkville Mfg. Co., Brooklyn, N. Y.

POLISHING AND BURNISHING; JOB AND CONTRACT (See also Electro Plating.)
Boston Tumble Barrel Plating Works, Boston, Mass.
Sievering, Philip, New York.

POLISHING AND GRINDING ENGINEERS (See Engineers.)

POLISHING WHEELS (See Buffing and Polishing Wheels.)

POLYSULPHIDE
Roessler & Hasslacher Chemical Co., New York.

POTASH

First Sorts
International Chemical Co., Philadelphia, Pa.

Real
International Chemical Co., Philadelphia, Pa.

POTASSIUM CYANIDE
Hardy, Charles, & Ruperti, Inc., New York.

POWDERED METALS

Aluminum
Kemp, W. H., Co., New York.

Bronze
Du Pont, E. I. de Nemours & Co., Wilmington, Del.

POWDERED COAL BURNERS (See Burners.)

POWER PRESSES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

PRESSES (Also see Scrap Baling Machine.)

Bench and Foot
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., & Co., Brooklyn, N. Y.
Shuster, F. B., Co., New Haven, Conn.

Hydraulic
Watson-Stillman Co., New York.

Power, all Types
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Garrison, A., Foundry Co., Pittsburgh, Pa.

PRESSES, DROP LIFTERS FOR
Miner & Peck Mfg. Co., Derby, Conn.

PRESSURE BLOWERS (See Blowers and Blow-Piping.)

PYROMETERS
Taylor Instrument Companies, Rochester, N. Y.

RARE METALS (See Metal Dealers.)

RECLAIMING MACHINERY, METAL (Also see Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, Ohio.
Standard Equipment Co., New Haven, Conn.

RECORDING THERMOMETERS (See Thermometers.)

REFINERS AND SMELTERS (See Smelters and Refiners.)

RETORTS, GRAPHITE
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.

RIDDLES (See Foundry Riddles.)

RIVET HEATERS, ELECTRIC
General Electric Co., Schenectady, N. Y.

RIVET MAKING MACHINERY
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

RIVETING MACHINES
Shuster, F. B., Co., New Haven, Conn.

RIVETS, NAILS & TACKS, ALL METALS
Hassall, John, Inc., Brooklyn, N. Y.

RODS, PISTON, TOBIN BRONZE
American Brass Co., Waterbury, Conn.

RODS AND BARS (Also see Brass Mill Products.)

Aluminum
British Aluminum Co., Ltd., New York-Toronto, Can.

Brass, Bronze and Copper
American Brass Co., Waterbury, Conn.
Rome Brass & Copper Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co., Pittsburgh, Pa.
Whitehead Metal Products Co., New York.

Monel Metal
Whitehead Metal Products Co., New York.

ROLLING MILL MACHINERY (See also Draw Benches; Hydraulic Machinery; Presses; Rolls; Shears; Slitters.)
Sundh Engineering & Machine Co., Philadelphia, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

ROLLS
Chilled and Sand Iron
Garrison, A., Foundry Co., Pittsburgh, Pa.
Jewelers'
Garrison, A., Foundry Co., Pittsburgh, Pa.
Leiman Bros., New York.

ROLLS AND COILS (See Sheets and Strip Metal.)
Brass, Copper and Bronze
Rome Brass & Copper Co., Rome, N. Y.

ROUGE (See Buffing and Polishing Compositions.)

RUST PREVENTATIVES
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
New Haven Sherardizing Co., Hartford, Conn.
Oakley Chemical Co., New York.

RUST PROOFING PROCESS
New Haven Sherardizing Co., Hartford, Conn.

SAND
Molding
Paxson, J. W., Co., Philadelphia, Pa.
For Sand Blasting
Standard Equipment Company, New Haven, Conn.

SAND BLAST CABINETS
Cleveland Blow Pipe Mfg. Co., Cleveland, Ohio.

SAND BLASTS
Accessories and Supplies
Standard Equipment Company, New Haven, Conn.
Barrel
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corporation, Hagerstown, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Standard Equipment Company, New Haven, Conn.
Cabinet
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Revolving Table
Sly, W. W., Mfg. Co., Cleveland, Ohio.
Sand Blast Systems
American Foundry Equipment Co., New York.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., Cleveland, Ohio.
Standard Equipment Company, New Haven, Conn.

SAND BLASTS AND EQUIPMENT
American Foundry Equipment Co., New York.
Pangborn Corporation, Hagerstown, Md.

SAND MIXERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

SAND SIFTERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

SASH, STEEL
Lupton's, David, Sons Co., Philadelphia, Pa.

SAWDUST
Hard and Soft
National Sawdust Co., Brooklyn, N. Y.
Dustless for Drying Out Metal Goods
National Sawdust Co., Brooklyn, N. Y.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
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Pryibil, P., Machine Co., New York.

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Economy Machine Products Co., Chicago, Ill.

SEPARATORS, MAGNETIC (See also Magnetic Separators.)
Magnetic Mfg. Co., Milwaukee, Wis.

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Yorkville Mfg. Co., Brooklyn, N. Y.

SHEEPSKIN POLISHING WHEELS
Yorkville Mfg. Co., Brooklyn, N. Y.

SHEET FELT
American Felt Co., Boston, Mass.

SHEET METAL PIPING FOR ALL PURPOSES
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
No-Dust Drying Machine Co., Providence, R. I.

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Driver-Harris Co., Harrison, N. J.
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Matthiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., New York.
Platt Bros. Co., Waterbury, Conn.

SHEETS, FELT
American Felt Co., Boston, Mass.

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New Haven Sherardizing Co., Hartford, Conn.

SHERARDIZING FURNACES AND EQUIPMENT
New Haven Sherardizing Co., Hartford, Conn.

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Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Boronic
American Boron Products Co., Reading, Pa.

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American Cyanamid Co., New York.
Roessler & Hasslacher Chemical Co., New York.

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Matthiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., New York.

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Great Western Smelting & Refining Co., St. Louis, Mo.
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Handy & Harman, New York.
Platinum
Roessler & Hasslacher Chemical Co., New York.
Silver
Handy & Harman, New York.
White Metals
Great Western Smelting & Refining Co., St. Louis, Mo.
Michigan Smelting & Refining Co., Detroit, Mich.
Zinc
New Jersey Zinc Co., New York.

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International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.

SODA, MODIFIED
Solvay Process Co., Syracuse, N. Y.

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Turner Machine Co., Philadelphia, Pa.

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Rome Mfg. Co., Rome, N. Y.
Western Cartridge Co., East Alton, Ill.

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Crown Rheostat & Supply Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, Ohio.
No-Dust Drying Machine Co., Providence, R. I.
Smith-Richardson Co., Attleboro, Mass.

STEEL, BORONIC
American Boron Products Co., Reading, Pa.

STIRRERS (See Graphic Products.)

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Brass, Copper and Bronze
Rome Brass and Copper Co., Rome, N. Y.

Brass, Copper and Nickel Silver
New England Brass Co., Taunton, Mass.
Scovil Mfg. Co., Waterbury, Conn.

Copper
National Brass & Copper Co., Lisbon, Ohio.
Rome Brass & Copper Co., Rome, N. Y.

Zinc
New Jersey Zinc Co., New York.
Platt Bros. Co., Waterbury, Conn.

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Wiarda, John C., & Co., Brooklyn, N. Y.

SULPHATE OF POTASSIUM
Buchanan, C. G., Chemical Co., Cincinnati, Ohio.

SULPHOCYANIDE OF SODA
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Excelsior Tool & Machine Co., E. St. Louis, Ill.

SWEEP SMELTERS (See Smelters and Refiners.)

SWING GRINDERS
Excelsior Tool & Machine Co., E. St. Louis, Ill.

SWITCHBOARDS (See also Electrical Apparatus and Equipment.)
General Electric Co., Schenectady, N. Y.

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Atlantic Tank & Barrel Corp., Hoboken, N. J.
Corcoran, A. J., & Co., Jersey City, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Kalamazoo Tank and Silo Co., Kalamazoo, Mich.
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Munning, A. P., & Co., New York-Chicago.
Passaic Carpenter & Millwright Shop, Passaic, N. J.
Stearns, A. T., Lumber Co., Boston, Mass.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Steel
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Metal Finishing Supply Co., New York.

TESTING APPARATUS (See Calipers, Indicating; Pyrometers; Scleroscopes; Thermometers.)

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Pitkin, Lucius, Inc., New York.

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Taylor Instrument Companies, Rochester, N. Y.

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Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

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TINNING FURNACES (See Galvanizing and Tinning Furnaces.)

TINNING FLUXES (See Fluxes.)

TOOL HARDENING FURNACES (See Heat Treating Furnaces.)

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Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
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Scovill Mfg. Co., Waterbury, Conn.
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Connecticut Dynamo & Motor Co., Irvington, N. J.

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Baird Machine Co., Bridgeport, Conn.

WIRE MILL PRODUCTS (See Brass Mill Products; Wire.)

WIRE STRAIGHTENING AND CUTTING MACHINERY (See Cutting, Straightening and Forming Machinery.)

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ZINC PRODUCTS
New Jersey Zinc Co., New York.

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Ajax Hydraulic Bronze

is an alloy that is particularly suited for use in castings which will be subjected to internal Pressure. For high pressure valves, fire hose couplings and similar uses it has no equal.

Ajax Process Standard Ingots

Ajax Plastic Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax Anti-Acid Bronze
Ajax Hydraulic Bronze
Ajax Golden Glow Brass
Ajax Manganese Copper
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Phosphor Tin

THE AJAX METAL COMPANY
Established 1880
PHILADELPHIA
OFFICES:
New York Chicago Boston Cleveland Washington

BRONZE INGOTS

also

Castings
Forgings
Rods
Shapes
Sheets

American Manganese Bronze Co.
Holmesburg, Philadelphia, Pa.

CLEVELAND: 508 Leader-News Bldg. DETROIT: 7644 Woodward Ave.
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NAUGATUCK VALLEY CRUCIBLES

Best for the Brass Foundry and the Casting Shop

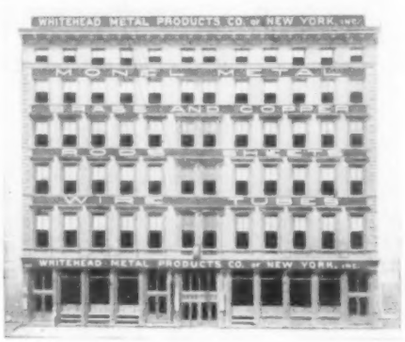
Made of high grade materials by skilful workers who give painstaking attention to every detail affecting quality.

Developed under the exacting conditions found in the great mills and foundries of New England, Naugatuck Valley crucibles are now used by many melters of metals throughout the country.

It will pay you to send us a trial order.

NAUGATUCK VALLEY CRUCIBLE CO.. -:- SHELTON, CONN.

At the center of the world's greatest brass producing district.



New York Warehouse
261-265 Canal St.
23-25 Howard St.

Branch Warehouses
Philadelphia
43 North 7th St.

Boston
67-73 N. Washington St.

MONEL METAL

Is Not Disintegrated by Acids Prevalent in the Plating Room.

STRONG AS STEEL NON-CORRODIBLE

Used for—Connecting Rods
Pickling Rods
Baskets
Tie-Rods
Nuts and Washers
Filter Cloth, etc.

We have a large stock in our three warehouses for immediate shipment.

WHITEHEAD METAL PRODUCTS COMPANY OF N. Y. Inc.

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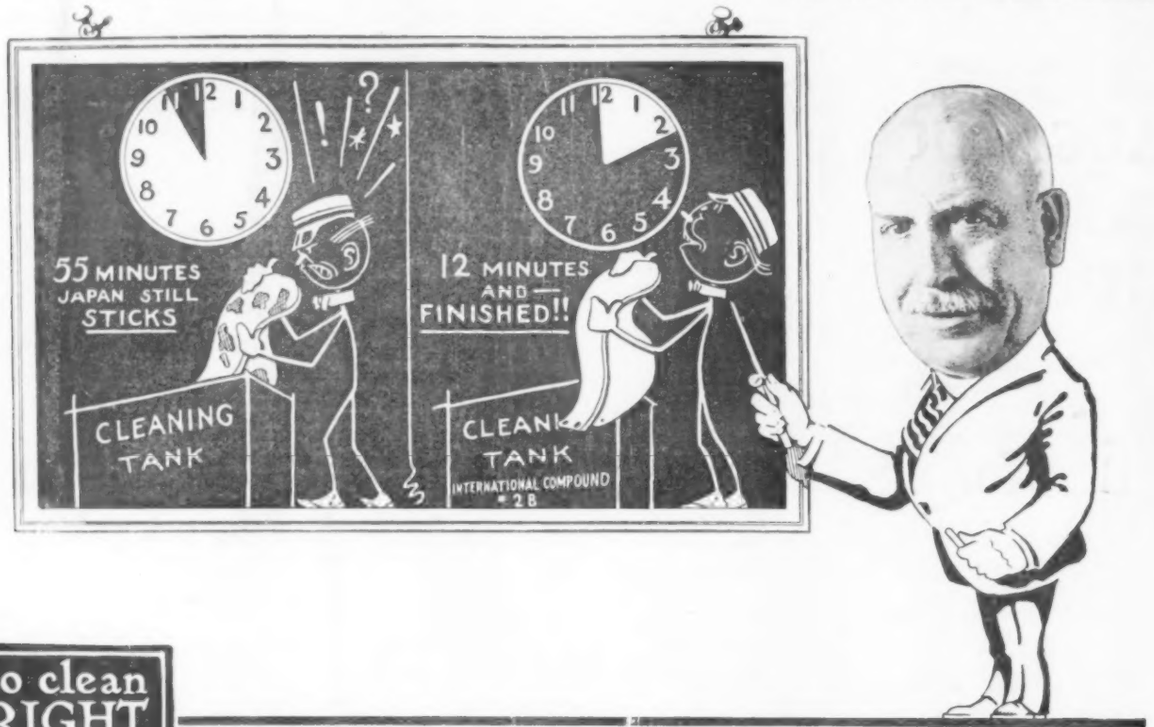

to clean RIGHT ask JOHN BRIGHT

Some cleaners take minutes—others hours to STRIP JAPAN

EXCUSE the picture. I drew it myself. What I am trying to illustrate is that our INTERNATIONAL COMPOUND No. 2B is the fastest japan stripper in existence. It smashed all records for time as well as price at a recent test.

Below is the official result of trials conducted in the plant of one of the largest corporations in the country:

MATERIAL	PRICE	TIME TO STRIP JAPAN
International Compound No. 2B	8c lb.	12 minutes
"A" (Mixture of two)	20c lb.	30 minutes
"B"	14c lb.	35 minutes
"C"	18c lb.	45 minutes
"D"	12c lb.	90 minutes
"E"	6.3c lb.	90 minutes

When I arrived at this plant, six cleaners from as many concerns had been tried. All had been tested using one-half pound of cleaner to the gallon of water. The lowest price cleaner cost 6.3c., but it took 1½ hours to do the job! No. 2B cost only 8 cents and stripped the japan clean as a whistle in 12 minutes.

I don't think I have to say any more. Let me ship you a barrel of No. 2B for trial. If it doesn't save you time and money on *every* japan, enamel and paint stripping operation just cancel our invoice. Awaiting your trial order,

Internationally yours,
John Bright

International Products
IC
International Chemical Co.

INTERNATIONAL CHEMICAL CO.
PHILADELPHIA ~~~~~ PENNA.